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OTTAWA

FIELD-NATURALISTS'

CLUB

Transactions No. 4.

OTTAWA, CANADA.

Citizen Printing and Publishing Company, Metcalfe St.

1883.

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FIELD-NATURALISTS' CLUB.

TRANSACTIONS NO. 4.

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OTTAWA, CANADA.

CITIZEN PRINTING AND PUBLISHING COMPANY, 31 METCALFE STREET.

1883

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HIS EXCELLENCY THE MARQUIS OF LORNE,
GOVERNOR GENERAL.

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SECRETARY:

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TREASURER:

W. P. ANDERSON.

LIBRARIAN:

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COMMITTEE:

S. CURTIS. F. R. LATCHFORD. J. B. TYRRELL.

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MESSRS. ANDERSON, CURTIS AND TYRRELL.

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SAUNDERS, WM., *F.R.S.C.*, President Ent. Soc. of Ontario, London, Ont.

EDWARDS, HENRY, Editor of "Papilio," 185 East 116th St., New York.

ANDERSON, REV. DUNCAN, *M.A.*, Spruce Cliff, Levis, Que.

LIST OF MEMBERS.

Adams, F. D., *B.A., Sc.*
Ami, H. M., *B.A.*
Ami, Samuel F.
Anderson, W. P., *C.E.*
Anderson, Mrs. W. P.
Armstrong, John R.
Armstrong, Rev. Wm., *M.A.*

Baptie, Prof. Geo., *M.A.*
Bell, E. B.
Bennetts, F. K.
Billings, B.
Billings, W. R.
Boardman, Wm. F.
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Bradley, Inglis W.
Bristow, A. A.
Bristow, Mrs. A. A.
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Brumell, H. Pareth
Burgess, T. J. W., *M.D.*
Butterworth, C. A.

Campbell, Wm.
Casey, Maurice W.
Castleman, J. S.
Chamberlin, Mrs.
Chisholm, A.
Chrysler, F. H., *B.A.*
Clark, T. McLeod
Coleman, L. H.
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Craig, Wm.
Cuzner, W. J.

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Dixon, F. A.
Donaldson, B.

Ewart, D.

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Fletcher, James
Fletcher, Mrs. J.
Fortescue, L.
Fortescue, Mrs. L.
Fuller, Thos., *R.C.A.*
Fuller, Thos. W.

Gemmill, J. A.
Grant, Miss Isabel L.
Grant, J. A., *M.D., F.R.C.S., F.G.S., F.R.S.C.,*
Grant, Miss Jessie
Grant, Miss Mary
Griffin, W. H.
Grignard, A.

Hale, J.
Hardie, John
Hardie, T. Melville
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Harrington, W. H.
Harrington, Mrs. W. H.
Harris, W. Dale
Harrison, Edward
Hodgins, John

Johnson, Geo.
Johnson, E. V., *C.E.*

Kearns, J. C.
Keeley, D. H.
Kilgannon, A. P., *C.E.*

LIST OF MEMBERS—*Continued.*

Lambart, *Hon.* O. H.
Lampey, Wm. G.
Latchford, F. R., *B.A.*
Lee, Miss K. G.
LeSueur, W. D., *B. A.*
LeSueur, Mrs. W. D.
Lett, W. P.
Lindsay, A.
Loux, Wm., *M.D.*
Lowe, John

McConnell, R. G., *B.A.Sc.*
McGill, A., *B.A.Sc.*
MacLaughlin, T. J.
McLaughlin, S.
McLean, J. D.
McMillan, John, *M.A.*
Macoun, John, *M.A.*, *F.L.S.*, *F.R.S.C.*
Martin, E. D.
Matheson, D.
May, Geo.

Nicholson, M. Vernon

Odlum, E., *M.A.*
Oxley, James M., *LL.B.*

Parris, Miss Oriana
Parris, Wm.
Perley, Henry F., *C.E.*
Plunkett, James
Poirier, P. S.

Rauscher, Rudolf
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Ripley, C. J.

Sawyer, D. J. B.
Scott, Miss Lilian
Scott, Wm.
Scott, W. L.
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Short, John
Small, H. Beaumont, *M.D.*
Small, H. B.
Sowter, E. T. W.
Steers, C. J.
Stewart, J. C.
Summerby, Wm. J., *M.A.*
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Symes, P. B., *A.K.C.*

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Tomlinson, J.
Tyrrell, J. B., *B.A.*, *F.G.S.*

Watters, Henry
Watts, J. W. H., *R.C.A.*
Warwick, Francis W.
White, Geo. R.
White, *Lt.-Col.* Wm.
Whiteaves, J. F., *F.G.S.*, *F.R.S.C.*
Whyte, Miss Isabella
Whyte, J. G.
Whyte, R. B.
Wicksteed, R. J., *B.C.L.*, *LL.D.*
Wiggins, E. Stone, *M.A.*, *LL.D.*
Wood, H. O., *P.L.S.*
Wright, Geo. C.
Wright, W. R.

Young, James

Annual Report of the Council.

To the Members of the Ottawa Field-Naturalists' Club:

The Council entrusted by you a year ago with the management of the Club, in submitting a report on the work of the year just closed, can, with much satisfaction, congratulate you on the progress which the Club continues to make in the objects for which it was organized.

Seventeen meetings of the Council were held, at which there was an average attendance of six of its members. Even an average two-thirds attendance of the members would be very satisfactory, but in reality the Council for a great portion of the year consisted of seven instead of nine members. Mr. Curtis only attended two meetings, and removed during the summer to the North-West, while Mr. Latchford only attended four meetings, and resigned his membership in the Club in the early part of November. The Council, however, did not deem it necessary to call a general meeting of the Club to fill the vacancies thus created.

One of the first acts of the Council was to appoint printing, excursion and soirée committees, and leaders in the various branches to give aid and information to members, and to keep records of the season's work. From these leaders were received valuable reports which were read at the soirées.

As stated in the circular then issued by the Council, prizes were offered in each branch for the best collection of specimens, and special prizes were also offered by the President. Only one of these prizes has been awarded, viz.: by the Botanical Branch to Mr. T. J. MacLaughlin for his fine collection of plants, the prize being "Gray's Manual of Botany." In connection with the prizes of the previous year (awarded after report of Council) it must be stated that the one given to Mr. Ami

was "Flowers, their origin, shapes, perfumes and colours," by J. E. Taylor, Ph. D., and that the *American Naturalist* for 1882, given to Mr. Latchford, was generously bound by the publishers on learning that it was intended as a prize.

Three excursions were held during the season :—To King's Mere on 8th June; Des Chênes Mills on 2nd September, and Brigham's Quarries on 21st October. The first one was the most numerously attended excursion ever held by the Club, while the others were to places not previously visited. Repeated endeavours were made to arrange for other excursions, but without success. The completion of the Canada Atlantic and the westward extension, now building, of the line from Aylmer, will give the incoming Council a wider choice of localities to visit.

There were five soirées, at which the papers to be published in the Transactions were read. A noticeable feature of these soirées was the increased discussion, insomuch that it is recommended to the incoming Council to distribute the reports and papers, so that more time may, in some instances, be allotted for their consideration.

The election by you, at the last annual meeting, of three officers—Secretary, Treasurer, and Librarian—to divide the labours formerly falling entirely upon one—the Secretary-Treasurer—has tended greatly to a more systematic and satisfactory performance of the respective and increasing duties.

The report of the Librarian shows that the Club continues steadily through its published Transactions, to be brought into friendly connection with scientific societies in this and other countries, and to extend its influence. The number of publications received as donations and exchanges—chiefly the latter—during the year was more than double the number of all those obtained in the three preceding years. It will be unnecessary to give a list of exchanges received, as it will be published in the Transactions. The increasing number of books and papers now received by the Club will render it necessary for the incoming Council to purchase a book-case for their reception.

The Council caused to be printed the Transactions (No. 3) of the Club for the year 1881-82, consisting of 66 closely printed pages, and

two excellent plates. The Transactions contain, in addition to the papers and reports read before the Club, a list of the birds so far recorded from this locality. Under the present system, all paid-up members are in possession of these Transactions, whereas, formerly, only one-fourth of the members obtained Transactions.

The Treasurer's report shows that the financial condition of the Club is very satisfactory, and that the increased subscription fee has not caused that diminution in membership that was somewhat feared when the change was made. At the close of last year the number of paid-up members was 88, and 22 have since paid for that year, making a total of 110. There are at present 99 paid-up members, and nine who may reasonably be expected to pay, making in all 108, or a decrease of two from the preceding year. During the year 16 new members were elected, and 22 ceased to be members, through resignation, removal from the city, or non-payment of dues. It will be unwise for the incoming Council to depend on a membership of more than 100, as the list now stands, and the advisability will suggest itself to them of taking energetic steps to obtain new members.

The number of corresponding members remains the same, although a change has been made in the substitution of Mr. Henry Edwards, of New York, for Prof. J. Macoun, who has made his home in this city, and has become an ordinary resident member of the Club. Mr. Edwards is a well known Entomologist, and has made valuable donations to the Club of his publications.

The Treasurer's balance sheet shows that, notwithstanding increased expenditures during the year, all claims against the Club have been paid, and that a satisfactory balance remains to its credit.

Signed on behalf of the Council,

W. H. HARRINGTON,

Secretary.

Ottawa, March 20th 1883.

TREASURER'S BALANCE SHEET.

The Treasurer in Account with the Ottawa Field-Naturalists' Club, 1882-83.

Dr.		Cr.	
To Balance from 1881-82...	$37 07	By Stationery, Postage, etc..	$19 21
Membership Fees.....	111 25	Excursion Expenses....	32 02
Excursion Receipts.....	30 10	Soirée do	7 08
Soirée do	5 70	Cost of Transactions No.3	117 65
Sales of Transactions...	32 15	Balance on Hand.....	40 31
	$216 27		$216 27

Wm. P. ANDERSON,
Treasurer.

20th March, 1883.

PROGRAMME OF SOIRÉES, 1882-83.

1. Wednesday, 6th December.
   President's Inaugural Address.—Mr. J. Fletcher.
2. Friday, 19th January.
   On the Laurentian System.—Mr. F. D. Adams, *B.A.; Sc.*
   Report of the Geological and Mineralogical Branch.
3. Friday, 2nd February.
   Fishes of the Ottawa District.—Mr. H. B. Small.
   Report of the Conchological Branch.
4. Friday, 16th February.
   Notes on and description of some Fossils from the Trenton Limestone. Mr. W. R. Billings.
   Notes on *Triarthrus Spinosus*, Billings. Mr. H. M. Ami.
   Report of the Palæontological Branch.
   Report of the Ornithological and Oölogical Branch.
5. Friday, 19th March.
   The Ducks of This Locality. Mr. W. P. Lett.
   Report of the Botanical Branch.
   Report of the Entomological Branch.

LIBRARIAN'S LIST OF DONATIONS AND EXCHANGES.

Massachusetts Horticultural Society :—"Transactions, 1882." Part II.

Cambridge Entomological Club :—"Annual Report, 1882." "Psyche" (Jan.-Aug.)

Geo. Dimmock :—"Special Bibliographies." Nos. 1, 2 and 3. "Methods of bleaching the wings of Lepidoptera." "Anatomy of the mouth-parts of some Diptera."

Wm. Couper :—"Canadian Sportsman and Naturalist." Vol. I.

Sandford Fleming :—"Letter on Standard Time for the United States, Canada and Mexico."

Epping Forest and County of Essex Naturalists' Field Club :—"Transactions." Part VI.

Montreal Natural History Society :—"Canadian Naturalist." Vol. X, Nos. 2, 3, 4, 5 and 6.

American Museum of Natural History :—"Report." "Bulletin." Nos. 2 and 3.

Henry Edwards :—"Papilio." Vols. I and II, complete; Vol. III, Nos. 1 and 2. "Pacific Coast Lepidoptera." Articles 2 to 30. "A Tribute to the Memory of Geo. Robt. Crotch." "Darlingtonia Californica." "Remarks of Robert E. C. Sturnes before the California Academy of Natural Sciences on the resignation and farewell of Vice-President H. Edwards." "Proceedings of the California Academy of Natural Sciences—Annual Meeting, 1876." "Notes on the genus Catocalla, with descriptions of new Varieties and Species." "Descriptions of new Species of Butterflies." "On the American form of Papilio Machaon." "List of Lepidoptera taken around Dayton, O." "New Moths, with partial Catalogue of Noctuæ, by A. R. Grote."

W. L. Kells :—"Rural Canadian." 5 Nos., containing articles on Canadian birds.

Alexander Ramsay :—"Scientific Roll." Ten numbers.

Boston Zoological Society :—"Quarterly Journal." Nos. 1, 2, 3, 4 and 5.

Canadian Institute :—"Proceedings." Vol. I, Part 1.

Montague Chamberlin :—"Bulletin No. 1 of the New Brunswick Natural History Society."

J. A. Guignard :—" Naturaliste Canadien" (containing observations on fertilization of Cypripedium by insects).

W. H. Harrington :—" Notes on some Species of Uroceridæ."

Buffalo Naturalists' Field Club :—" Bulletin." No. 1.

W. L. Scott :—" Report of the Geological Survey of Canada, 1879-80."

P. B. Symes :—" Report of the Department of the Interior." 1881.

H. B. Small :—" Mineral Resources of the Dominion of Canada."

Carl H. Schultz :—" Mineral Water Controversy."

Physikalisch-ökonomischen Gessellschaft-Königsberg :—" Schriften-der Physikalisch-ökonomischen Gesellschaft." 13 Nos. 1876-1881.

Jos. M. Wade :—" Ornithologist and Oölogist." 1882.

THE PRESIDENT'S INAUGURAL ADDRESS.

JAMES FLETCHER.

Members of the Ottawa Field-Naturalists' Club, Ladies and Gentlemen :

Another year has passed and it is again my lot to give you the opening address of the winter course. It is with much pleasure that I have to inform you that the affairs of the Club are in a very satisfactory condition. Our membership roll becomes steadily larger, and, I am happy to say, includes several ladies. The Club is becoming day by day more widely known and popular. Its transactions are sought in exchange by kindred societies in all parts of the world, and I have no hesitation in saying that it is having an appreciable effect here in Ottawa towards educating the community to take an interest in the many beautiful objects of nature which surround them on every side. I will not, perhaps, go the length some of our correspondents do, and say we are doing more than any other local Society in Canada in furthering the study of Natural Science ; but yet it would be affectation not to acknowledge that, for the age of the Club, and for the size of the population of the city, from which it has to draw its members, the work that has been accomplished is most creditable. In glancing through the three parts of Transactions which have been published, one noticeable feature is that the work has been evenly distributed, that it has not all been done by one or two only of the most active members ; as an instance, during the three winter courses of lectures, there have been 31 papers on original work, and these have been read to us by as many as 22 different members of the Club. Now, this, I consider, is an exceptionally large proportion, for of course there are one or two of our leading naturalists from whom we like to hear something every year, and also, at the same time, there are, as you all know, several of even our most active workers in the field who have never yet given us the benefit of their studies and researches in the shape of written papers which we could publish. In this year's programme you will observe that there is only one set paper for each evening ; this has been thus

arranged by the Council in order that there may be a short time at every meeting during which can be read notes of any interesting occurrence or discovery which, although of importance as a fact to be recorded, may not be of such a nature as to warrant the preparation of an elaborate paper. I venture to hope that before the season is over we shall have, in this way, many valuable observations brought under our notice. This leads me again to impress upon you all the necessity of taking notes. It is utterly impossible for any one who wishes to advance in the systematic study of Natural Science to carry the results of all his investigations in his brain. A Naturalist should have his note-book always with him—in the field, in his study, and even in carrying out his daily business. Everything not before observed must be noted down at the time, and no pains must be spared to have these notes systematic, exact, and, above all, legibly written; the date, locality and circumstances must always be given, and observed facts must never be mixed up with theories or conjectures. There is a great temptation for everyone to get into a hurried, untidy way of making notes, under the idea that as they are only for his own use and no one else will ever see them it does not matter. This is the greatest mistake imaginable, for experience teaches that if notes are to be of any real use for future reference the greatest care must be taken with every detail. It is seldom that notes are required immediately after being made, because, of course, the original occurrences are fresh in the memory; but it frequently happens that some unexpected event turns the mind to a branch of study which has been comparatively neglected for a long time; and I know of nothing so disappointing as, upon turning up your notes of experiments or observations, which you remember to have prosecuted most carefully, to find that, at the time, they had been scantily or imperfectly recorded. In scientific matters the memory must never be trusted to for anything; whenever a fact is proved, note it down; if true, it is sure to be of use either to yourself or someone else at a future date.

In addition to the short notes by members at the different soirées, greater efforts will be made this year to exhibit attractive specimens and collections, and if there is any one here to-night who possesses anything of more than usual scientific interest they will confer a favour on the Club by notifying the Secretary, and lending it for one of these

evenings. During the past year important work has been done by the Club towards carrying out its main object, viz.: the investigation of the Natural History of the locality. New plants and fossils have been found, and new birds have been observed, and, notwithstanding that the season has been exceptionally barren, as far as perfect insects are concerned, the Entomologists have succeeded in securing some rare species both of Coleoptera and Lepidoptera, as well as some rare larvæ of the latter order. Notices of all these discoveries will be given in the reports of the leaders of the several branches.

The number of our corresponding members remains the same ; but there has been a slight change in the substitution of the name of Mr. H. Edwards, the editor of " Papilio," for that of Prof. Macoun, who is now an Active Member of the Club. By the appointment of Prof. Macoun on the Geological and Natural History Survey, and his removal to Ottawa, the Club has received a most powerful acquisition. Prof. Macoun is well posted in all branches of Natural History, and a thorough Botanist and Ornithologist, one, too, who is as generous and able in imparting information as he is energetic and successful in acquiring it. To Mr. W. Saunders the Club owes some kind and complimentary notices in the " Canadian Entomologist," a spirited monthly magazine quite indispensable to everyone who wishes to study Canadian insects. Mr. Saunders, too, is just about to supply a want, which has for very many years been felt in Canada, by the publication of a work on the Insects injurious to Fruit Trees, and his name alone is sufficient guarantee that it will be thoroughly done. Our other corresponding member, Mr. Hill, still continues to show his interest in the Club by frequent remittances of British Columbia plants and insects. During the past season a box of beautiful Fresh-water Shells has been received from Mr. Gilbert Heron, who is now in Texas, and the Library has been enriched by the addition of several valuable works, chiefly transactions of other Societies and Magazines of Natural History. Among these I would call special attention to the following :—

Twelve parts of Transactions of the Physico-Economical Society, of Königsberg, received from the Society through the influence of Prof. R. Caspary. This Society is one of great influence, and the publications are of a very superior class. Of special value to the Entomologist are

"Psyche" and "Papilio." The first named has been published for some years by the Cambridge Entomological Club, and ranks in age next to the "Canadian Entomologist." "It is indispensable to everyone occupied with the insects of North America." "Papilio," unlike "Psyche," is entirely devoted to a single order of insects—the Lepidoptera—and contains descriptions of many new butterflies and moths in addition to more general matter. A complete set of this magazine has been presented to the Club by Mr. Henry Edwards, the editor, and also one of our corresponding members, together with a valuable series of original writings on Entomology, published at different dates. The "Canadian Naturalist and Sportsman," published in Montreal, is ably edited by Mr. W. Couper, who is well known as an energetic hard-working student of nature, well worthy of support by all naturalists. Dr. A. E. Foote's "Naturalists' Leisure Hour" is a most valuable little paper, which gives every month, together with interesting items of science and extracts from the best scientific periodicals, a list of works for sale, in all branches of Natural History, and one can thus frequently secure a rare book for a small sum.

It is not often in the scientific annals of any country that so many important events occur as we have seen take place during the last summer here in Canada. First, and undoubtedly the most important, was the formation and formal opening of the Royal Society of Canada. This institution, which was conceived and brought to perfection mainly through the foresight and well-directed energy of our noble patron, His Excellency the Governor-General, is based on a general plan drawn from the leading national academies in other countries. In England the Royal Society occupies itself with scientific subjects only, and the same may be said of the National Academy of the United States. Our Canadian Society, imitating the Royal Irish Academy, cherishes in addition literature and history. The Institute of France, composed of five sections, includes also fine arts in its scheme. All of these bodies, founded at different dates, have the same object in view, namely, the cultivation and encouragement of all branches of intellectual culture, by the bringing together periodically, from all quarters, the scattered workers (who form always so small a proportion of the whole) for the mutual encouragement and interchange of ideas—than which nothing

so soon clears away inaccuracies and narrowmindedness, and, in fact, without which progress is impossible. Nor are the proceedings of the Royal Society confined entirely to its members. To keep up its dignity it could only include the very first men in letters and science ; but as in a large country like Canada it was very difficult to decide upon whom this honour could be conferred, the only true course which could be followed was adopted, namely, judging of men not by reputation, but by the works they had actually produced. It was, however, felt that there were many able men who, although they had never published any completed works, were yet capable of producing work which would not only bring credit on themselves, but on their country also. As a means to benefit by this, it was decided to invite each of the societies of any acknowledged standing in science and literature to send annually a representative delegate, to attend the meetings, who would have the privilege of reading papers by members of his own society, and joining in all the discussions that might arise on the different subjects introduced, and further, the papers so read would be treated exactly the same as those of the full members of the Royal Society, and if of sufficient value for publication would be included in their Transactions. I am sure it is a matter of no small gratification to all present to hear that your Council has been notified by the Secretary of the Royal Society that this Club is considered worthy of being represented at the next annual meeting. I may mention, too, that in acknowledging this compliment the Council stated that whoever was chosen by the Club as President for next year would also act as delegate on that occasion. The Royal Socicy is not content with reading and discussing papers alone ; already they have taken an important step in petitioning the Government to abolish the duty on scientific publications, and have prepared a plan of action which, as soon as funds are available, will be put in force for communicating with different parts of the Dominion, with the view of building up a National Museum. As no political influence has been allowed to creep in, it is indeed to be hoped that the Government will see its way to make a grant for the purpose of assisting them in carrying out what they propose, and in publishing the results of their labours. Moreover, the obligation will not be all on one side, for, as Dr. Sterry Hunt has remarked, " the executive authority will always have in the Society

an organized body of councillors, drawn from what is highest and best in the scientific life of the nation, to which they can always look for advice and direction in scientific matters relating to the interests of the State." It seems to be universally conceded that all the preliminary steps were most wisely thought out and arranged, and every care taken to choose the very best men Canada could produce to represent the different sections. The choice of the Secretary, the active officer, upon whom devolves all the hard work, and upon whose energy so frequently depends the success or failure of a new venture, was a very happy one in the person of Mr. Bourinot, also one of our members, and so well known to every reader and student of Canadian History, for his charming articles, which have appeared from time to time in the serial literature of this country, and whose writings have received most favourable notices in England, both from men of letters and the press. The event next in importance, to which it is neccessary for me to refer, is the late meeting of the American Association for the Advancement of Science, held in Montreal. Scientific life had its birth in Canada in 1857, when the American Association met here before, and from that time on, fostered by a few here, and nobly helped by our friends across the line, it has gone on quietly gaining supporters and devotees, until now scientific knowledge is recognized by all to be a necessity. The strides taken in this direction and the discoveries made by its aid are almost beyond conception. At the meeting in Montreal were gathered together the leading Scientists of this continent, and not a few Canadians embraced the opportunity of meeting personally and consulting with the great minds, which, by means of correspondence, had, perhaps, for several years been necessary to them in carrying out their studies. When the joint excursion, composed of the members of the American Association and the Forestry Congress, honoured our City with a visit I am happy to say that the members of this Club were among the most active in making and carrying out arrangements for their reception and entertainment; and how far overpaid were we for any trouble we may have taken, by the pleasure of meeting and conversing with such men as Principal Dawson, of McGill College, the President of the Association for the year; the celebrated Biophysiologist, Dr. Carpenter, acknowledged to be one of the first philosophers of the day; or Dr. Asa Gray,

who has done more for Botany in America than any other living man, to whose every word our Botanists eagerly listened ; or to Dr. Brewer, author of part of the Botany of California. Dr. George Vasey, who had promised, if possible, to pay Ottawa a visit, was, much to our disappointment, detained in Washington by official business. Among many other men of note who visited us on this occasion may yet be mentioned, Dr. Rae, the Arctic explorer ; Prof. Dall, celebrated for his researches in Alaska, and Profs. Newberry and Hall, the Geologists. Those of us who were fortunate enough to attend the meeting in Montreal might have met many more celebrities, as Dr. Sereno Watson, the first authority on Botanical Nomenclature, and at the annual meeting of the Entomological Society of Ontario, held at the same time, might have listened to the experiences of, and consulted with, men like Dr. Hagen, and Profs. Riley, Comstock, Mann, and Fernald, among many others who rank among the first Entomologists of the day, and whose names are almost as familiar in Europe as they are here. With regard to the Forestry Congress, which was convened immediately previous to the A.A.A.S., it would be impossible to mention anything of greater importance to Canada than the subjects which were discussed at its meetings, viz : the protection and preservation of the forests, which have been the source of the greater part of her wealth. Judging from the crowded meetings, and the enthusiastic utterances of the delegates who attended from every direction, as well as from the vital importance of the subject, which should only require to be brought prominently before the public as it was at this time, we may confidently hope that before long the working of this Society will be manifest from one end of Canada to the other, and many of us here may yet live to see the vast prairies of the North-West Territory covered with a mantle of luxuriant foliage, as some people believe they formerly were.

During a trip through a large tract of this country in September last I paid special attention to this matter, and I see no reason whatever why many of our hardy trees should not flourish there if the seeds are sown and the young plants protected for a year or two by rows of the indigenous willows which grow by every stream. I have sent to a friend in Regina a supply of some of the seeds of this district, and

hope in a few years to hear that they were only the first of many plantations, started by other settlers through that fertile country. One of the good effects of the attention paid to tree planting will doubtless be the beautifying of our streets and public highways, by the planting of shade-trees in every available spot, for one of the wise provisions of the Society is that every member must plant 25 trees every year or pay a subscription.

In 1884 Canada is to honoured with a visit from the British Association for the advancement of science and there is little doubt but that the study of the natural sciences will receive as great an impetus from this visit as it has from that of our American cousins.

But I have dwelt at sufficient length on these matters to show that we in Canada have received such benefits during the past year as to make us responsible for much in the future. It is therefore the duty of everyone, who takes a true interest in the welfare of his country, to strive to help on in every way possible the cause of science, so that no benefits may be lost which are derivable from these events I have mentioned, and which surely mark a new epoch in the intellectual development of our country.

In looking over the programme of this winter's entertainments, you may have noticed that it does not include any papers on Entomology or Botany. With your permission I will endeavour to remedy this deficiency by directing your attention for a few minutes to some matters in these two branches which it has occurred to me might be entertaining and instructive.

* * * * * *

A case of insects belonging to the order Hemiptera, which had been caught in the vicinity of Ottawa by Mr. Fletcher and Mr. Harrington, was exhibited, and the life, histories and habits of the most interesting were explained. This was much facilitated by some fine enlarged figures executed by Mr. Harrington on the black-board.

* * * * * *

Now there are a few points of botany I wish to bring before your notice. Some of you may remember that in my inaugural address last year, I drew your attention to the small flowered yellow water-lily which is found in the Ottawa River and which Botanists have

always considered to be an American form of the European *Nuphar luteum*. I then stated that, from an examination of the fruit, which is very rare and hardly ever perfectly developed, as well as from differences in the stigmatic disk and habit of the plant, I believed it was only a hybrid between the two species *N. advena* and *N. Kalmiana* both of which grow in the same locality. I also stated that, at that time, this opinion had not been confirmed by any other Botanist. When in England last year I examined all the plants of this order in Kew herbarium and there found a few specimens apparently identical with ours labelled "*N luteum*, variety. From America." I also inquired who was the highest authority on *Nuphar* and was referred to Prof. R. Caspary, the Director of the Botanic Gardens at Konigsberg, in Prussia. I wrote to this gentleman on the point in question, sending him both dried specimens and living roots, and, at the same time, asked him his opinion as to the identity of *N. Kalmiana*, Pursh, with *N. pumilum*, Smith, supposed to be identical, but concerning which I could not satisfy myself. His answer, received on 20th March last, was very satisfactory. He writes, after detailing some most interesting experiments with European species, which would be too technical for reproduction here, but which I may state lasted over a period of 20 years: "I have not the slightest doubt but "that your *Nuphar luteum, var. Canadense* is *Nuphar advena* + *Kalmiana*. "It is intermediate between the two, and what is decisive is this, that its "pollen is bad. There was not much pollen in the flowers you sent, but "I got 155 grains, and of these only 7, as far as it is possible to judge "from the dry specimens, had any fovilla; that is, about 95 per cent, were "bad. *Nuphar advena* and *Kalmiana* both have very good pollen." Again, on the other question, he writes: "From many experiments "(some of which he details) I conclude with complete certainty that "*Nuphar Kalmiana* and *N. pumilum* are different species, although the "morphological differences are very slight, but the two plants abhor each "other physiologically."

Through the kindness of Mr. Robertson, the Superintendent of the Government gardens, I am enabled to exhibit to you this evening a most remarkable biological specimen, which illustrates better than anything I have ever before seen the beautiful truth first enunciated by the poet Goethe, that all the petals, stamens and pistils of a flower are but

leaves,and the flower itself a small branch specially modified for the purpose of reproduction. In this *Fuchsia* flower there is one ovary and one tube, but instead of the four sepals presenting their usual appearance two of them are foliaceous leaves ; this is, of course, abnormal ; but the chief peculiarities are in the next verticil of leaves which forms the corolla, for two of these are changed into small, but perfectly formed, and pedicelled buds ; and it is carried further than this, for even inside this there is another large bud which represents the pistil.

I fear I am trespassing on your patience, but there is yet one subject more upon which I should like to say a few words. It is with reference to the use of making collections, and I take much pleasure in specially recommending a little work by Dr. Taylor, the Editor of Science Gossip, " On the Collection and Preservation of Natural History Objects."

The great end of all scientific study should be the development of a love for the objects investigated, and a thorough mastery of all that can be learnt concerning them. This can only be done by collecting specimens and preserving them in the most convenient manner for reference and one fault which must be guarded against is the amassing of a large number of specimens just for the mere sake of having them. Nor is much gained even if a collector is well acquainted with the Latin and English names of Natural History objects ; there are many people who can give the names at first sight of every specimen in a large collection, and yet who know nothing of the history of one of them. It would be,by far, better to know well the history of one specimen in a large collection than to know all by name. Let the learning of the names be the alphabet of science, a means by which a further knowledge can be acquired, and let every specimen represent so much information, to which the very mention of its name will conjure up a crowd of associations relative to the study by which you became acquainted with it. The use of a collection should be, in general terms, a means of providing material for study at any convenient moment.

In building up a collection always try to secure perfect and characteristic specimens, so that any student referring to your collection can learn as much as possible about each species. It will sometimes be necessary to get specimens from naturalists living at a distanee, and this

will bring you into correspondence with men of kindred tastes in all parts of the world. The pleasure of making a collection is entirely in the associations which centre around it, and the intercourse which is, by its means, brought about with other students. Large numbers of duplicates will always be accumulating; these should be carefully preserved for exchanging; but, remember, as duplicates they are worthless to you, and never attempt to drive a bargain, or to get value for value, but always strive to give more than you receive. It is better by far to give away every specimen for nothing than to hoard them up to be possibly destroyed by insects, or even to take up room which could be better employed. Never send away a poor specimen; of course, always preserve the best specimen obtainable for your own collection, and if of a species not represented, preserve even a very poor one until you get a better, but after this send the very best you have to the first correspondent who asks for it. If a specimen is too poor to send away destroy it and get it out of the way. Never promise a rare species unless you actually have it,or are positive you will be able to carry out your promise, and, above all things, endeavour to gain a reputation for fair-dealing and generosity.

Note.—The following specimens, mentioned above, were exhibited:—Specimens of *Nuphar advena* + *Kalmiana*, Caspary, and the two species *N. advena*, and *N. Kalmiana*, from which this hybrid is derived. A painting of the first by Mr. W. H. O. Watts. Two plants of the Fuchsia, one with the normal flower, the other with the remarkable abnormality referred to above. Microscopic slides of *Psylla celtidis-mamma*, Riley. A case of Hemiptera. A painting of *Lewisia rediviva* by Mrs. Chamberlin.

ON THE LAURENTIAN SYSTEM.

Frank D. Adams, B.A.,Sc.

The Laurentian System is the oldest series of stratified rocks which we are at present acquainted with on our earth. In whatever part of the world we can extend our observations below the base of the newer fossiliferous rocks, we find a great series of schists or slates, and below these again a great series of various kinds of highly crystalline rocks, gneisses, quartzites, etc., often with bands of limestone, and

which, as far as we at present know, are, with the exception of eozoon, quite destitute of organic remains. This latter is the Laurentian System which we are to consider for a few minutes this evening. In many localities the overlying series of schists is wanting, so that the newer fossiliferous rocks repose directly on this older gneissic system. The Laurentian is then the foundation on which all the more recent systems are laid down. It is the only universal formation, since it exists in all parts of the world, although in most places concealed by newer deposits. This great system of crystalline rocks, although pretty uniform in lithological characters, is known by different names in the different countries where it has been studied. The name Laurentian, from the River St. Lawrence, along whose northern shore it extends for several hundred miles, was given to it by Sir William Logan, who spent much time in studying it during the earlier years of the Geological Survey of Canada. In Germany and Scandinavia it forms the lower portion of the "Grundgebirge." It has also been called "Urgebirge," the Primitive Formation, and forms part of the Archean System of Dana.

In addition to the large areas over which the Laurentian is exposed in North America, it is extensively developed in various other parts of the world. In Europe it is most widely spread in Scandinavia and Finland, but occurs in Bavaria, Bohemia, and probably Silesia, in Germany, as well as in the north of Scotland, and probably in many other localities. Baron von Richthofen has recently described the occurence of two unconformable series of gneisses in China, both of which he correlates with the Laurentian System. He states, however, that they are destitute of crystalline limestone. In India immense areas of gneissic rocks have been mapped by the Geological Survey of that country. Similar rocks are also found in Japan and in south-east Africa, and occur over very extensive areas in Brazil, Venezuela, Chili, and the Guianas.

The area occupied by Laurentian rocks in Canada was estimated by Sir William Logan to be about 200,000 square miles. Speaking generally we may say that they form a band extending from Labrador to the Ottawa, and which, after sending a spur across the boundary line into the United States, forming the Adirondacks, takes

a sharp turn, sweepi off in a north-westerly direction to the Arctic Ocean. The two arms of this band thus form tangents to the Arctic Circle. The northern limits of those Laurentian rocks is not as yet exactly known. The Gulf St. Lawrence forms its southern limit from Belle Isle to Cape Tourmente, a distance of about six hundred miles. For the next two hundred miles their southern limit runs west south-west, and is distant from the St. Lawrence in rear of Montreal, about thirty miles. It then follows the Ottawa for a hundred miles, turns south toward the St. Lawrence, meeting it again at the Thousand Islands, which are caused by the passage of this belt of hard rocks across the river. Crossing at the Thousand Islands, the Laurentian expands into an area of about ten thousand square miles in the State of New York, forming the Adirondacks. The southern limit then runs off toward Lake Huron, whose east and north shores it forms, and then continues on, as before stated, to the Arctic Ocean. We thus see that this great V shaped area of Laurentian rocks has its longer arm approximately parallel to the Rocky Mountain chain and Pacific border, and its shorter one parallel to the smaller Appalachian chain and Atlantic border. "Hence," says Prof. Dana, "in the very inception of the continent not only was its general topography foreshadowed, but its main mountain chains appear to have been begun, and its great intermediate basins to have been defined—the basin of New England and New Brunswick on the east; that between the Appalachians and the Rocky Mountains over the great interior; that of Hudson's Bay between the arms of the northern V. The evolution of the grand structure lines of the continent was hence early commenced, and the system then initiated was the system to the end. Here is one strong reason for concluding that continents have always been continents; that, while portions may have at times been submerged some thousands of feet, the continents have never changed places with the oceans." *

These old crystalline rocks give a peculiar character to the scenery wherever they occur, producing, with but few exceptions, a surface covered with low hills having a peculiar rounded contour, quite distinct from the serrated and rugged outlines often seen in hills and mountains

* *Manual of Geology*, p. 160.

composed of rocks belonging to the newer systems. The rounded outlines of the hills are remarkably well seen from the Village of Chicoutimi, on the River Saguenay, looking toward the north, and also, though in a less marked manner, from Parliament Hill, if one looks across the Ottawa, over the Townships of Eardly and Hull, which, together with the neighbouring Townships of Wakefield, Templeton, Portland, etc., are composed almost exclusvely of these Laurentian rocks, affording us here in Ottawa abundant material for their study.

The most important and by far the most common of the rocks composing the Laurentian System is that which is known by the name of gneiss. This term originated with the Freiberg miners, who from ancient times used it to designate the rock in which the veins of silver ore occur, and more especially such parts of the rock as were much decomposed. As now employed it denotes a foliated rock composed of quartz, and orthoclase feldspar, which later, however, is sometimes replaced in part by plagioclase feldspar. Hornblende, pyroxene, mica and garnet are also common constituents, and in many cases form a considerable proportion of the rock. The so-called fundamental gneiss of the north-west of Scotland, for instance, is, according to Zirkel, principally hornblende gneiss, that is to say, contains hornblende in addition to quartz and orthoclase, and* as in the case of the corresponding member of the family of the granites, this variety, rich in hornblende, contains sphene, a mineral often found abundantly in our apatite openings. Gneiss, like many of the eruptive rocks, is seen, when thin sections are examined by means of the microscope, to contain very numerous minute acicular crystals of apatite; little zircon crystals and little particles of iron ore are also very common, and these three minerals, as a rule, possess much better crystalline forms than the other constituents of the rock. The rock, as before stated, is foliated, that is, the constituents are arranged in more or less parallel bands. In these bands one mineral preponderates, but does not, as a general rule, prevail to the total exclusion of the others. When mica is present the leaves are arranged parallel to one another, thus giving the rock a more or less easy cleavage along this plane. Gneiss

* Die mikroskopische Beschaffenheit der Mineralien and Gesteine, p. 465.

may be either coarse or fine grained and of various colours, generally some shade of red or gray. Differences in texture, as well as in composition, give rise to varieties. Thus, for instance, there is schistose gneiss in which the mica forms continuous, thin, parallel, even lamellae, which separate the granular layers composed of quartz and feldspar, "granitoid gneiss, in which the foliation is very obscure and the rock somewhat resembles granite," and "augengneiss," or eye gneiss, in which large individuals of orthoclose are embedded in a somewhat lenticular shape supposed to resemble an eye.

The great beds of limestone, which, as mentioned above, are often interstratified with the gneiss are generally white, but sometimes have a greyish, pinkish, or salmon colour. They are generally coarse grained, but sometimes saccharoidal in texture, and usually contain a number of accessory minerals. In Dr. Hunt's memoir on the Laurentian limestones of North America he enumerates no less than fifty-four mineral species occurring in them. These minerals, especially when found in limestone veins, are frequently well crystallized, and most beautiful combinations are often found, such as bright green apatite, or pyroxene crystals, in a matrix of coarsely crystalline pink limestone. These limestone bands are well exposed in the Township of Hull, and in the Grenville region contain the celebrated Eozoon Canadense.

Associated with these limestone beds are beds of quartzite, hornblende schist, pyroxene rock, garnet rock, etc., often of considerable thickness.

Another class of rocks which are found in many places in the Laurentian system and which are deserving of mention are the so-called anorthosite, labradorite or Norian rocks. These occur not only in Canada but also in Scandinavia, New York, and in the North of Scotland. In Sweden, where they have been most carefully studied, they are in part, undoubtedly, true members of the Laurentian system, while some of the more granitoid varieties are undoubtedly intrusive rocks. They are characterized by the predominence of plagioclase or lime soda feldspar, the frequent occurrence of hypersthene and pyroxene, and the almost entire absence of quartz. A strange but very important fact in relation to these rocks is that, in America at least, the iron ores associated with them are always so far as we at

present know titaniferous, the percentage of titanium being as a general rule too high to permit of them being employed for the production of iron.

In the Geology of Canada published in 1863, Sir William Logan gives as the result of his study of the Laurentian system in the Grenville region the following section through the series, arranged in ascending order :—

		feet.
1.	Orthoclase Gneiss of Trembling Mountain, probably exceeding	5,000
2.	Trembling Lake limestone	1,500
3.	2nd Orthoclase Gneiss	4,000
4.	Green Lake limestone with bands of gneiss and garnet rock	2,500
5.	3rd Orthoclase Gneiss	3,500
6.	Grenville limestone with bands of gneiss	750
7.	4th Orthoclase Gneiss	1,580
8.	Proctor's Lake limestone	20
9.	5th Orthoclase Gneiss, passing into anorthosite	3,400
10.	Anorthosite, thickness wholly conjectural	10,000
		32,250

Mr. H. G. Vennor, who, while connected with our Geological Survey, studied these rocks for many years, commencing his investigations in the district about Hastings County, Ontario, and continuing them northward across the Ottawa into Ottawa County, and who also studied them in the anorthosite area north of Montreal, has recently given to Dr. Selwyn a condensed statement of the results of his investigations. He divides the Laurentian system into three subdivisions. The lowest of these, which he calls Division *A*, is a great mass of syenitic gneiss, generally deep red in colour and is destitute of crystalline limestones and mineral deposits. This probably is equivalent to the lowest or Trembling Mountain gneiss of Sir William Logan's section. Following this in ascending order is a series of hornblendic and pyroxenic rocks, diorites, anorthosites, etc., constituting his Division *B*, and which is in its turn overlayed by another series of gneisses, which, however, are associated with numerous bands of crystalline limestone, and contains great deposits of graphite, apatite and iron ore. Mr. Vennor believes Divisions *B* and *C* to be comformable to one another and to overlie Division *A* unconformably. Division *B* and *C* form but a small portion of the whole series and occur merely as a

border or rim around immense areas of the older gneisses of Division *A*. Both *B* and *C* carry iron ores; those of *B* being finely crystalline, while those of *C* are coarsely crystalline. If these sub divisions prove to be correct, and the lowest or Trembling Lake gneiss belongs to Division *A*, the upper gneisses and limestones of Division *C* would in the Grenville region have, according to Sir William Logan's measurements, a thickness of about 15,000 feet.

In Bavaria the Laurentian has been found to have a thickness of not less than 90,000 feet.

In closing, let me say a few words on the various views which have been put forward to explain the origin of this immense series of crystalline rocks which we have just been considering, asking you to bear in mind that here we leave the domain of fact and enter that of hypothesis. As yet comparatively little is known of the great Archaic System as a whole, and every new investigation yields rich and unexpected fruit. Although, as Dr. Kalkousky remarks, * it is very difficult to make our observations on these rocks completely objective, yet that is the aim which we should have in view, and we may then hope, after long continued, careful and thorough investigation, to be able to decide with a high degree of probability as to the method in which this great system of rocks originated. Of all the theories hitherto put forward to account for the genesis of these crystalline rocks, no single one is in a position to give a satisfactory answer to all questions regarding them, and, as Nauman well says,—the real mode in which these primitive rocks were formed is still involved in such obscurity that they may with perfect justice be termed cryptogenous rocks.†

Speaking generally, there are at the present time three hypotheses maintained by different schools. According to the first of these the rocks in question are the first solidified crust of our planet. The foliated structure and banding not being due, like the bedding in more recent formations, to aqueous deposition, but to agencies at work in the cooling of a fluid mass, the earth as is usually supposed having been formed by the gradual condensation of a mass of fiery vapour. We know that

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* Ueber die Erforschung der archäischen Formationen—Neues Jahrbuch für Mineralogie, etc., 1880, II p. 1.

† Lehrbrich der Geognosie—Zweiter Band s. 155.

many undoubtedly igneous rocks have a more or less well defined banded structure and parallel arrangement of the constituents, induced by the movement of the rock while in a liquid or viscous state. Some such motion it was thought might produce the foliated structure seen in these gneisses and allied rocks. Of course since the earth is supposed to have solidified first at the surface, the higher members of the series must be older than those on which they rest. This hypothesis found many illustrious supporters, but does not by any means satisfactorily explain the repeated alterations of different varieties of gneiss, limestone quartzite and other rocks, seen in the Laurentian system.

Dana, in 1843, * put forward a modification of this hypothesis. He supposed that gneiss and mica schist bore to granite a relation somewhat similar to that which volcanic tuff and debris bears to our modern lavas. He saw in these rocks the products of great volcanic eruptions which took place under great pressure at the bottom of the ocean and which were compacted and altered by the action of the superincumbent waters highly heated by the eruption. The enormous extent and thickness of the primitive formations and their occurrence, frequently quite independent of larger granitic masses, do not favour this view. Dana himself subsequently saw reasons for rejecting it, and says of the Laurentian rocks in his Manual of Geology published in 1875 :—" The alternations of hornblendic and other schists, with quartzite, limestone, gneiss and other rocks, prove that all were once sedimentary beds, beds formed by the action of moving water, like the sandstones, argillaceous beds, and limestones of later times. They have no resemblance to lavas or igneous injections." And again " these Laurentian rocks are made out of the ruins of older Laurentian, or of still older Archœan rocks, that is, of the sands, clays and stones made and distributed by the ocean, as it washed the earliest formed crust of the globe." The second hypothesis has been ably advocated by Dr. Sterry Hunt. It agrees in some respects, though differing in others, with the old neptunian theory of Werner. Werner taught that all rocks, eruptive, crystalline and sedimentary, were deposits from the waters of a primeval ocean. According to this theory all silicated, stratified rocks, and pro-

* American Journal of Science—1843, p. 105.

bably to a certain extent the limestones as well, have not originated from the alteration of either ordinary aqueous sediments, or of volcanic materials. Furthermore, to use Dr. Hunt's words, the "conditions under which these rocks were deposited and crystallized, whether in shallow waters, or in abyssal depths (where pressure greatly influences chemical affinities) have not been reproduced to any great extent since the beginning of palaeozoic time," and "the eruptive rocks, or at least a large part of them, are softened and displaced portions of these ancient neptunian rocks, of which they retain many of the mineralogical and lithological characters."* Although, according to Dr. Hunt, the conditions under which the crystalline rocks were deposited are not reproduced at present on the earth's surface to any great extent, yet we see the same processes going on in a much less energetic form in the action of the thermal waters of Plombieres and other localities in France, on the masonry of the old Roman baths. Various minerals, such as apophyllite, scolezite, opal, etc., have been formed by the action of the heated waters on the constituents of the concrete, and are found filling cavities in the bricks, as well as interstices in the cement. Daubrée considers that the lime, alumina and silica of the minerals so produced have been derived from the mortar and the bricks, while the water has chiefly furnished the alkalies. These changes have taken place at temperatures not above 70°. The production of the crystalline rocks at a temperature as low as this does not preclude the possibility of the existence of life on the planet in this early time, indeed Dr. Hunt has argued that in the occurrence of great beds of iron and graphite in the Laurentian, we have evidence of at least an abundant flora. The process supposed by this theory would probably find an analogue in the agencies at work in the formation of mineral veins.

According to the third hypothesis, which is at present very generally held in England and America, owing largely to the commanding influence of Zell, though not originated by him, the crystalline rocks under consideration may be of various ages, in some cases comparatively recent, but have undergone changes subsequent to their deposition, often metasomatic in character, which have caused them to become

* The History of some Pre-Cambrian Rocks in America and Europe, p. 3. See also, Chemical and Geological Essays by the same author.

thoroughly crystalline, obliterating at the same time any organic remains which they may have, and in many cases probably did contain. In any great region of crystalline rocks, although now tolerably constant in lithological characters, there may be, according to this theory, alteration products of rock, of various ages ; and the same great series may in one part of its distribution be represented by uncrystalline fossiliferous sediments, and in another by thoroughly crystalline rocks, such as gneiss or hornblende schist. Two ways have been suggested in which this alteration might take place. 1st. The alteration has, according to Zell, been induced principally by the internal heat of the earth acting on deeply buried sediments, or, 2nd. According to Bischoff, the alteration may have been due, not primarily to any recrystallization by heat, though this may also have helped to effect the change, but to the action of percolating waters from higher levels holding salts in solution, and acting either at ordinary temperatures or at temperatures higher than we ordinarily experience at the surface of the earth. According to this theory, we might have the same bed of limestone, according to the nature of the circulating mineral solutions, in one place altered into pyroxenic or amphibotic rock, in another into a garnet or epidote rock, and in a third into a quartz-feldspar rock.* It is, of course, supposed that the action has been continued through immense periods of time, but, although the time which has elapsed since the Silurian is enormous, it is not to be taken into account in this connection, since in the case of *our* Laurentian, at any rate, the metamorphism must have been completed before the Huronian rocks were deposited, since, the latter in many places hold rounded pebbles of the former, undistinguishable from the rock as elsewhere found in place. Those who now hold this theory generally consider that both the interior heat of the earth and the action of percolating waters have played their part in the alteration. Some remarkable experiments on the effects produced in solid bodies by the action of great pressure, lately made by Spring,† throws much light on a possible method of the crystallization of sedimentary rocks. Among numerous other interesting results, he found that peat, when submitted to a pressure of 6,000 atmospheres was converted into a hard

* See Credner. Elemente der Geologie p. 213.

† Bull. de l'Acad. Royal des Sci., etc., de Belgique, 1880, 2nd Ser. vol. XLIX.

shining black mass, with exactly the appearance of coal and the scaly structure which coal possesses. Coal, under a pressure of 6,000 atmospheres, was moulded with ease. Precipitated alumina, dried at a temperature of 140°, became fluid under a pressure of 5,000 atmospheres. Many chemical reactions were also induced by pressure, for instance, copper filings and sulphur, when mixed together and submitted to pressure, united, forming a crystalline black sulphide of copper. A mixture of chloride of mercury and copper filings at a pressure of 5,000 atmospheres underwent a change into chloride of copper and mercury. Amorphous iodide of mercury under a pressure of 4,000 atmospheres became compacted into a block, showing, under the microscope, a mass of translucent crystal fragments. It thus appears that great pressure alone can, in certain cases, at least—1st, soften, and even melt solid bodies (coal, peat, alumina); 2nd, crystallize bodies capable of assuming crystalline form (iodide of mercury); 3rd, induce chemical reactions (chloride of mercury and copper filings). All regions composed of crystalline schists show in the complicated folding and twisting of their strata evidence of having been submitted to tremendous pressure. In great pressure we probably have a very simple and beautiful explanation of many cases of regional metamorphism. In order to be so altered, however, the original rocks would have to contain all the elements required for the production of the resulting crystalline schists, since by pressure alone the change could only be one of diagenesis.

FISHES OF THE OTTAWA DISTRICT.

H. B. Small.

Note.—*The nomenclature adopted is taken from Jordan and Gilbert's latest synopsis of the Fishes of North America.*

The fishes of Canada and especially of this district, present a field of observation as yet very partially travelled, and one that will repay minute investigation. Not only are there doubtless species as yet unobserved and undescribed, but a more careful description and comparison of those already noted will contribute much to the progress of

this branch of science. The Annual report of the Commissioner of Fisheries of the Dominion contains much information valuable to the statistician and to the mercantile community, but is scarcely adapted to the wants of the naturalist, and it is not to be expected that such reports should do more than furnish records of fisheries carried on for commercial purposes in various districts. In this connection I may state that the report of 1881 enumerates the catch of fish during the year by divisions or districts, but only mentions those best known as marketable. For instance in the Upper Ottawa and Gatineau division it gives the yield of trout, whitefish, bass, pike, pickerel, maskinonge, sturgeon and mixed fish and the number of eels. The value is not given, but by putting the lowest estimate on the yield I find that it represents nearly $25,000, and it will be safe to add to that at least $15,000 for the catch of other waters of this district, making a total value of $40,000.

I much regret that my own personal observations in the Ottawa district have been limited, but such as they are I give them.

I am indebted to the President of this Club, Mr. Fletcher, for reference to lists published by the Ottawa Natural History Society of 1859—1863, which are in his possession, and in which certain fishes are mentioned as belonging to the Ottawa district, but presumably that meant the Ottawa River generally. They do not comprise all the fish I now mention, and they allude to three of which I am very dubious, viz.: The ribbon fish, the splendid pike and the red-bellied minnow, enumerating each of these as a different species. They also mention the shad, to which, however, I shall allude in its proper place. The existence of these lists shows how interesting for reference in after years may be a compilation, which at the time seems unnecessary, and I would here remark how useful it would be if each naturalist were annually to keep a record of all he sees, confining himself to the branch he most delights in. This has been done as regards birds and the dates of their arrival here in spring, and it could easily be extended to other branches of natural history. All records are useful, sooner or later, if properly kept, and many a little incident, trifling as it may seem at the time, might prove of great value in determining some question that may arise at a future period.

First of all comes the Perch family, of which the common or yellow perch *(Perca Americana)*, closely resembling its European name-sake, abounds in both lake and river, pond and stream, varying considerably in size and colour, according to locality and food. Three pounds is the extreme weight I have heard of, but a one-pound perch is a large specimen ordinarily. A lake near Buckingham, known as Donaldson's Lake, is full of very fine perch and of good quality, and is perhaps one of the best fishing grounds near here for this species. Spawning in autumn, these fish recover so as to be in fine condition in the early spring and even in the winter, when they may be taken in large quantities through the ice. The sharp-nosed perch (*Percina Caprodes*) is much rarer, but is abundant in the Rideau Canal, and is met with in the Rideau and Ottawa Rivers, and their tributaries occasionally. It's distinguishing features are chiefly the sharpness of its nose, long and narrow body, and some seven dark vertical bands, with an equal number of spots or irregular bands. DeKay doubts it being a different species, and thinks it only a variety. It attains no size, seldom reaching more than three or four ounces in weight.

The Doré, yellow pike perch, or glasseye, often erroneously called pickerel (*Stizostedium Vitreum*) is abundant in our waters, and though its habits and form suggest the idea of a pike, it is really more of a perch. It is very voracious, excellent eating, frequents the foot of rapids or eddies in rapids, and is easily taken with a spoon or live bait. Large specimens reach from 8 to 10 lbs. weight, but 4 lbs. is an average size. It is more abundant in rivers than lakes, only frequenting the latter where streams enter them. Long trolling lines are far more successful than short ones for this fish, as it has been proved that the bait will be seized three times on the long line to once on the short one. The Canadian Doré (*S. Canadense*) ranging from 1 to 4 lbs., with a few pale yellow spots below the lateral line, and the grey Doré (*S. Griseum*) of a greyer colour than the two preceding, seldom exceeding a few inches in length, are found where the common Doré exists, but not so abundantly. They are met with in the Rideau, Ottawa, Lievres and Gatineau Rivers, the grey Doré being plentiful in the Rideau River.

The Tessellated Darter *(Boleosoma Olmstedi)* is a small fish, never exceeding more than 2 or 3 inches, and is very little known from

a habit it has of lying on the bottom. It has a series of black spots on its back, and another series along the lateral line. It frequents clear springs or streams, lying for a while perfectly still at the bottom, and then darting off with great velocity after its prey or in sport. I have found it in clear pools and in several shallow streams in this vicinity, and have watched their curious habits in my aquarium.

The Rock Bass *(Ambloplites Rupestris)* is well known in all the streams and rivers of this locality wherever large stones abound, or at the foot of mill races and in the back waters of eddies. Its extreme weight ranges from one to one and a half pounds. It readily takes the hook, biting eagerly at worm, minnow, or cray-fish, especially the latter. It also rises to the fly, especially in the dusk, either morning or evening.

The Black Bass *(Micropterus Dolomien)* ranks high among the game fish of this vicinity, and is found in most of the waters around here. A distinguishing feature over all other of its congeners is a red speck in each eye like a dot of carmine. When fully grown its length is about 15 inches, and its weight ranges from one to five or six pounds. It differs much, not only in colour but in form, according to the water it frequents. It is a very active fish, and when hooked often leaps violently out of the water. It generally lies close to the bottom in still water, or is found frequenting the foot of rapids. Both the rock and black bass exhibit what may be called a parental affection for their helpless offspring when they first appear, and are very tenacious of the spot they have selected as a breeding place, sailing back and forth to keep off all other finny intruders. I have often noticed a circular sandy space amidst stones at the bottom of a clear pool in our rivers, with a pair of bass hovering over it. These bare places are where the spawn is deposited, and may be accounted for by the fish having removed all obstacles, rolling them to one side or the other either with the mouth or by rubbing their belly backwards and forwards over the spot, and so forming a circular wall or bank. After the young fry appear, the parent fish watch them for a few days till they are strong enough to hide themselves in natural cover, and the hatching place is then abandoned. Numbers of these places may be seen in any pool where bass abound. Whilst watching, if any other fish appear, an attitude of defence is assumed by the erection of the spines of the dorsal fin, and the rigidity

of the pectorals, when, like an armoured knight of old, the fish after poising itself thus for a moment, makes a sudden charge at the object of its attack, repeating it over and over again till the intruder withdraws. Some very fine black bass are to be found in the deep water of the dam above Hogsback on the Rideau, and in the bays of the Ottawa. The Gatineau and Lievre are too washy for bass to lie there. In the lakes of the Rideau River, and in the lakes of Ottawa County very large ones are caught, Lake Bernard being perhaps one of the most prolific places. A very large specimen was on exhibition in Mr. Esmonde's window last summer, caught in Lake Bernard, and weighing 5 lbs. $8\frac{3}{4}$ oz., being one of, if not the largest, on record here.

The Oswego or Spotted Bass *(Micropterus Salmoides)* is somewhat similar to the foregoing, but has a larger head and wants the red spot in the eye. The body also is more oval, and thinner. It abounds in the Rideau Canal, and is found in all the rivers here, but more sparingly. Large ones are taken in Leamy's Lake weighing up to 2 lbs. The flesh is watery, flaky, and insipid.

The Sunfish *(Lepomis Gibbosus)* which is said to derive its name from its fondness for basking in the sun in shoal water, is common everywhere except in the sharp running mountain streams of the Laurentian range, and yet I remember once being horribly disappointed when trout fishing below Old Chelsea, at finding after a smart tug at my line in an old disused weir beside an obsolete tannery, a miserable little sunfish instead of the expected trout. It may be called from its colours a very beautiful fish, is lively and active, and as Jardine says, it vies in beauty and brightness with tropical fishes. It is a very amusing subject for an aquarium where it soon asserts its superiority by its boldness, but is very destructive to any soft finned fish therein, persecuting them whenever they approach the quarters it has taken up. In its natural state, individuals will sometimes take up a position under a large stone, or at the foot of a rock, and act as a kind of police for a certain distance on either side, darting out with fins bristling and driving away intruders. A prominent feature about the sunfish is a black spot terminating in bright scarlet on the lower end of the gill cover, and its throat and belly are of an orange and gold colour, with occasionally a blueish tinge in certain lights, from which latter it has

not inappropriately been compared to the humming bird. A smaller fish, the Pond fish (*Lepomis Auritus*), with a body more robust and thicker than the preceding is found often associated with it, and almost as numerous. Its throat and belly, however, are of a pale whitish colour, and the absence of the scarlet spot on the gill cover is an easy means of distinction. These fish are the joy of the youthful angler, and in catching them it is very questionable if the older disciple of the rod bent only on game fish has half the pleasure of the school boy.

The common Bullhead (*Uranidea Cognata*) is a small repulsive looking fish very little known from its habit of secluding itself beneath stones in sharp running streams. It seldoms exceeds 2 or 3 inches in length, has a broad, flat head, one-third the length of the body, and furnished with two curved spines. The gape of its mouth is very large, and eyes large and prominent, which give it the appearance of looking upwards. Its body diminishes from the head and becomes compressed towards the tail. The only places where I have met with this fish are in a small stream north of Buckingham, and in the Chelsea trout stream. That they are not abundant is evident from the fact that I do not remember ever taking more than four specimens in the two localities in all my fishing experience there, three of which, if my memory serves me right, were in the Buckingham stream. It is doubtless to be met with around here, but is one of the fish that require looking for, and even then is likely to elude ordinary search. It is not improbable that other species of this family, two of which are known in the North-West, may be found here, and this is one of the *genera* that would repay investigating.

The four spined Stickleback (*Apeltes Quadracus*) and the five or six spined Stickleback (*Eucalia Inconstans*) are so common in ditches, brooks and ponds, and especially in Lake Flora in Hull, that they are the object of persecution by every unbreeched urchin who can procure a crooked pin and a yard or two of thread on a willow twig. A peculiarity of this genus is that they do not deposit their spawn on the bottom like other fish, but actually build a globular nest of water weeds and *conferva* about the size of a musket ball, balanced or fixed between rushes, or in a tuft of submerged grass or aquatic weeds. Dr. Fortin, in his notes on this fish, says, that the building of the nest is

entrusted to the male, and that several females deposit their eggs in the same nest ; that a single male impregnates all the eggs of one nest, and that he has to defend them against the voracity of other fish, and even of the females themselves till they are hatched, his vigilance only ceasing when the young are able to provide for their own safety. Of the accuracy of this I cannot speak with any certainty ; Dr. Dawson is inclined to believe that the carefully built nest may have for one of its objects, to guard against the destruction of the embryo in the ova by microscopic animalculæ. The same writer affirms that when irritated or alarmed, it will remain motionless over some part of the bottom resembling its own colour, which it possesses the power of deepening almost into black.

The Sheeps-head (*Haploidonotus Grunniens*) is found in the Ottawa, but is by no means common, though formerly it is said to have been quite abundant. Last summer some very fine specimens were to be seen at the fish stalls, taken from the river near Templeton. Its back is considerably arched, giving it the appearance of a white bass, eyes large and mouth small. A peculiarity about this fish is that the first ray of the spinous or prickly portion of the dorsal fin is short, the third longer than the second, and so in proportion till the ninth is longest of all. It is sometimes called erroneously white bass and white perch.

The Catfish genus will reward the student's careful examination of every individual that falls under his notice, for the scientific world is yet in doubt as to the number of species that compose it. The channel catfish (*Ictalurus Lacustris*) is met with in the Ottawa River, in the deepest parts or channel, and specimens of it may occasionally be seen in our market of ten lbs. weight and upwards, but a fish of over 4 lbs. weight is a large one for these waters, although in the south and west they attain an enormous size. Its forked tail, one lobe of which is slightly longer than the other, easily distinguish it from the common catfish (*Amiurus Catus*), which is very common in any water with a muddy bottom. A peculiarity about it is that occasionally its ventral fins are wanting. Another strange feature is that in early spring it burrows into the bank and forms a semi-circular dam of mud and clay in front of its burrow, with an aperture to swim in and out of. In this burrow the female deposits her spawn, and the only portion visible outside the

burrow is the barbels which are in constant motion. It falls at this time an easy prey to the spear, and to many prowling animals. I find some six other species of this genus described, and I am inclined to think that two at least of them (*A. Pullus*) the brown, and (*A. natalis*) the black catfish, exist in the waters round here.

The Chub Sucker (*Erimyzon Sucetta*) or small chub, is common in rapid dashing streams especially in the south side of the Ottawa, and in the early spring is abundant in the waste water stream from Hartwell's Locks, and in many of our small rapid streams. It is very different from the fish ordinarily known in our rivers as the chub, which will be mentioned presently, and which is really the Roach-dace. The long finned Sucker (*Carpiodes Cyprinus*) seems to be a connecting link between the chub and sucker family resembling both, and is not uncommon.

Of the Sucker family several species frequent our waters here. The common sucker (*Catastomus Commersoni*) attains a weight of from 3 to 4 lbs., but its flesh is soft. It is one of the first fish that can be caught in spring. The rock Sucker* (a variety) has a firm flesh, and is freer from small bones. It is found in the shallows of the Rideau and Ottawa and in the Gatineau, and attains a weight of 5 or 6 lbs. The pale Sucker* (a variety) runs up the sluggish streams from the larger rivers as soon as the thaw sets in in spring, but is insipid. The long nosed Sucker, (*C. Longirostris*) is a smaller fish seldom exceeding 5 or 6 inches, frequenting the smaller streams, and is sometimes called the brook-sucker.* It is very useful in an aquarium, where it acts as a scavenger, clearing up the refuse of other fish. A curious habit it possesses is drawing in by suction a small portion of fine clean sand from the bottom, and transporting it to another part of the aquarium where it deposits it by blowing it out and then returning for more. The horned Sucker (a variety) is found in our rivers, but is not so abundant as the other species. It has a number of tubercles on its head (hence its name) the use of which is not apparant, but which are thought to be merely a sexual distinction. The large scaled Sucker (*Moxostoma Macrolepidotum*) is taken in the Ottawa, and attains a weight of 7 or 8 lbs.

* These are local names.

It is easily distinguishable by its large scales, firm appearance, and closely resembles the carp of Europe. It and the rock Sucker are the two best fish of the genus for eating.

The Roach Dace (*Semotilus Bullaris*) is the fish erroneously called chub; it is abundant in the rapids of all our rivers where it affords good sport, taking equally well a worm, a fly, or a grasshopper. Its average full size is from 1 to 1½ lbs. in weight. The Redfin or Rough head (*Minnilus Cornutus*), frequents deep holes or pot-holes of rapid streams associated with brook trout. It has a leathery mouth, and is abundant in the Gatineau, Blanche, and all tributaries of large rivers. It is plentiful in the pools of the Chelsea trout stream where the water is still and muddy bottomed, and is very destructive to the ova of trout. Numerous tubercles on its head give it the appearance of being covered with minute prickles. It is sometimes called horny dace or horned chub. The black nosed dace (*Rhinicthys Atronasus*) known generally as the brook or striped minnow is abundant. This fish sometimes has a rich orange colouring on its belly, and in some specimens this is so sharply marked as to have given rise to the idea of the existence of a different species to which the name of red bellied minnow (*Chrosomus Erythroyaster*) has been given. In an Ottawa paper of 1866 is an article entitled "Notes on the lakes and lake fishes in the vicinity of Ottawa, by a member of the Isaac Walton Club," the writer of which, I fancy, was the late Dr. Van-Cortland. As the first part treats of this fish, I quote it here:—"In the Village of Hull, immediately behind the drying grounds of Eddy's pail factory, deep seated in a rocky crater, there is a sheet of water which although only about two acres in extent has acquired *par excellence* the name of Minnow Lake. Until lately, and since the adjacent ground has been built upon and so disfigured by those tinder boxes which constitute Wright's Town, it was a most beautiful and inviting object to look down upon from the surrounding cliffs, which on the eastern side rise perpendicularly to a considerable height, the highest portion of the rock being some 70 feet above the water. During the spring freshets an imperfect communication is effected by a sluggish outlet with Brigham's Creek which it taps at the natural cave just behind the stone house at the old distillery causeway, but which in the summer season being nearly dried up, answers another and a very different purpose, namely,

that of securing an inviting retreat for the innoxious ringed water snakes which in great numbers glide all gracefully amongst the ramification of its dank sub soil. The fish from which the lake, or rather pond, takes its name are not true minnows but the black nosed dace, which literally swarm in its waters. They are daily captured in hundreds, and yet without any apparent diminution in their numbers. Together with them, but in much smaller quantities, is found a very beautiful little fish, and whose location, as far as I have seen, is limited to this circumscribed basin, the scarlet bellied minnow (*Leuciscus Erythrogaster*). They are taken either with a minnow hook or dip net, and when placed in an aquarium as objects of attraction, are not far behind their well known congeners the gold fish. In their habits they differ from their other lacustrine companions, inasmuch as they descend into the deep water much earlier and rise again to the surface later in their respective seasons." Now, I think this fish is only a variety of the blacknosed dace, and I have taken similar fish in the quarries near Montreal, and had them in my aquarium. The shining dace (*Minnilus Rubellus*) known also as the white minnow is abundant, and its young or small fry are the fish which throng the edge of wharves, and shallow water below locks, where they can be taken abundantly with the scoop net. A very small dace (*L. Pigmoeus* ?) pigmy dace or small minnow is very abundant in shallow water, where it is frequently left high and dry after floods in large numbers.

The Shiner,(*Notemigonus Chrysoleucas*) is a very handsome fish, with a brilliant lustrous white or golden tinge all over it. Its scales very easily rub off in handling. It is an ornament to the aquarium. It is found in all our streams in calm water, but is not very abundant, it being eagerly devoured by fish of prey and proving a tempting bait.

Of minnows proper there is only one species, the black minnow or barred minnow (*Umbra Limi*). These fish are very tenacious of life. They are not as abundant here as in the St. Lawrence, but I have found them in the clay pits near the Rideau River, and in the lagoon east of the canal near Hogsback, as well as in small streams running into the Lievre and Ottawa Rivers. These fish partially bury themselves in the mud in dry weather and are very hardy. They possess a peculiar habit of balancing themselves in midwater, with the

pectorals in perpetual motion, and will at times dart violently to the surface and down again instantaneously, remaining a long time without going to the surface to respire. They are an excellent bait for bass fishing.

The Pike (*Esox Reticulatus*) is a well known fish everywhere, but it is an undecided question whether the pike of this country and of Europe are the same, or different species. I think, however, there is very little essential difference. What has been styled in this country as a different species of pike, namely, the splendid Pike (*E. Phaleratus*), is, I believe, the ordinary pike in various stages of growth. Another species, the northern Pike, (*E. Lucius*) is met with here occasionally. It is a noticeable fact that the dorsal fin of the pike is placed very far back, thus greatly facilitating his movements through the weeds. There are two peculiarities connected with this fish not perhaps generally known, the one that he is during the summer particularly listless, basking near the surface, when no bait, however tempting, can allure him; in fact he rather retreats or backs from it. Now, at this period, small fry are commencing their active existence, and this listlessness looks like a marked feature in fish economy, for the small fry at this time swim around him with apparently total unconcern. These remarks refer more particularly to pike in shallow water, as in the lakes and deep rivers this habit is not noticeable. The other peculiarity is that during the fall it spends the daytime in deep water, and at night in the shallowest water along the shore, frequently coming so near land as to display its fins. What its object in so doing can be is hard to say: some think it is to enjoy the warmer temperature of the shallow water, and others think it is for the purpose of watching for and capturing small land animals that come to the water's edge at night. It cannot be for spawning, as that takes place in spring. I am rather inclined to the belief that its object is to rid itself of parasites, by rubbing on gravelly bottoms and shoals. There is much confusion between the pike and his cousin the Maskinongé (*E. Nobilior*) for which overgrown pike are often mistaken, but any person who has seen the two fish alongside can always afterwards distinguish them. Its mandibles are larger than those of the pike, tail more forked and larger, or lunate, while that of the pike is bilobed, back of a dark grey, and its sides lighter and

blotched with black. Its flesh is much firmer, and it attains the largest size of all fish in this district, if we except the sturgeon. It is found in the Ottawa and Rideau Rivers, and in the Canal, and in the lakes connected with the Gatineau and Lievres Rivers. Its name is said to be derived from the Ojibway (*Maska nonja*), long snout ; the early French settlers called it (*masque langue*), or long visage. Ordinary bait presents no attraction in the larger fish, and a fish of one or two pounds should be used to catch the large ones, or a spoon twice the size of those ordinarily used. Near the Quio is one of the best fishing grounds for this fish, but very large ones are taken in the Rideau. Mr. Lapointe tells me the largest maskinongé he has ever offered for sale was 42 lbs. Pike equalling in weight the largest maskinongé are recorded by early writers, such as that described by Pliny, taken in the Rhine, which weighed 1,000 lbs. and was caught with a hook attached to a chain (*catenato hamo*) and drawn out by oxen (*boumjugis*). That fish surely must have been a sturgeon, and if weighed, the scales must have been of doubtful veracity !

Whether the common Salmon (*Salmo Salar*) was ever abundant in the Ottawa River prior to its sawdust and mill refuse pollution is a question on which history is silent, as far as any authentic data can be given ; but that they did frequent it there is no doubt, as the name Salmon River was retained by a small tributary near Montebello, long after the native fish had abandoned its waters. A few years ago experiments were tried for restocking that stream by artificial means, and our worthy Commissioner of Fisheries interested himself largely in the undertaking. For the first two years after the young fry had been turned out, there was every promise of success ; the young fish were healthy and grew perceptibly. The third year, however, was one of great drought, and although during the spring and early part of the summer several small salmon were found in the fishermen's nets, later on the water fell so low and became so warm that no fish of the salmon tribe could live, and in the following year they seemed to be extinct. The venture however was again tried, and for two seasons numerous small salmon in various stages of growth were seen. In the fall of the second year, misfortune again doomed the fish to destruction. There was at the head of Salmon River a lumber dam which backed the waters of the main stream into a long swampy strip, separating the

stream from a neighbouring group of lakes for the purpose of filling the channels to float logs down to the Ottawa River. A wire grating was placed across the mouth of the main water-course, and a gate with a wire screen was fixed in the dam to keep out the coarse fish abounding in the drowned land and small lakes. These barriers were removed in the fall by some mischievous hand, and the river below soon swarmed with fish of prey. On one day in the following summer, Mr. Whitcher informed me he killed some 40 pike in the stream, and out of one fish of about 6 lbs. weight he took 17 young salmon of small size. Finding it impossible to rid the river of its new inhabitants, no attempt to restock it has been made, but the fact was abundantly proved, that if unmolested, salmon would live and thrive there.

Mr. Whitcher has subsequently reared in small ponds on his own grounds here, California and Lake Ontario Salmon, and his experiments with them are of great interest. In three years they have grown from 1 to 10 inches, but he says they seem stunted in growth and their taste is insipid. At certain times the instinct of migration is strong upon them, and they then constantly endeavour to escape from their enclosures, by leaping out on to the grass on the side nearest the Rideau River, the ponds being near the latter, as if they knew that their means of migration lay in that quarter.

Of the brook trout of this district, only one species is acknowledged, but I am inclined to think that there are really several species in existence here if properly examined; yet a careful investigation might show they are only varieties. The common trout (*Salvelinus Fontinalis*) is well known in the lakes and small rapid streams of the Laurentian Mountains; its belly is a silvery white with vermillion dots and yellow spots in the vicinity of the lateral line. Its flesh is white. The red bellied trout (*Salmo Erythrogaster*) has its sides of a bronze colour with rich salmon colour spots, intermixed with crimson, belly of brilliant reddish orange, and its flesh an incarnate red. It has been confounded with the ordinary brook trout and looked upon as only a variety, but, independent of other considerations, DeKay says, the regularity and brilliancy of its colours renders it proper to designate it by a distinct specific name. Jordan considers it only a variety. Various causes have been assigned for the great variety

of colour in individuals of both species, one being difference of food, and another of water; the latter probably has the most to do with it, as we know that trout that inhabit ponds or lie in deep pools under cover, are dark coloured externally, and those in clear streams running over sandy bottoms, are light and vivid of colour. Trout, moreover, inhabiting still, sluggish waters, dams and lakelets, are of stouter proportions than those of rapid, tumbling streams. The difference is remarked by all who have fished the waters of Ottawa County, those of the lakes being deep of body and proportionately short, while those taken in the outlets are longer and afford more sport when hooked. No trout are found in the waters south of the Ottawa, east of the Chats, where the Laurentides cross the river, whilst above that they abound in the streams on both sides. I have as my authority the late Dr. VanCortlandt for stating that though they have been placed in streams on the south shore, they never lived there any time. The reason for this probably lies in the fact that from the different geological formations of the country on the two sides of the Ottawa, the streams to the south are more liable to be filled with surface water which the trout cannot endure, and neither are they ordinarily as limpid and pure as the mountain streams and lakelets.

Of the Lake or Salmon trout in this district little is really known as to species. I can only find one kind alluded to as abundant, namely, the lake Trout, (*Salvelinus Naymacush*) which is found in most of the larger lakes in Ottawa and Pontiac Counties, and occasionally in the Lievre and Gatineau, but always near the outlet of a lake. It attains a large size, though its average full weight in these waters is from 8 to 12 lbs. One was brought into Buckingham by some Indians a few years ago, which weighed close on to 30 lbs., and in a paper read before the O. N. H. Society in 1865 specimens of those fish are mentioned from the Opeongo of between 50 and 60 lbs., and a specimen that had been caught that summer in Meach's Lake weighing 23 lbs. There is a trout locally known as the grey trout abundant in many of the lakes north of us, seldom attaining more than 4 or 5 lbs. weight. I am firmly of opinion that several species of lake trout inhabit our waters, and that it only requires examination of distinguishing features to define them. All the lake trout lack the

activity of brook trout, and afford but little sport when hooked. Spearing in autumn, when the fish come in the shallows to spawn, threatened not many years ago to extirpate them entirely in some of the more accessible lakes, and I have known of parties going up to Whitefish Lake on the Lievre for that purpose, who returned with several barrels as their spoil. Thanks, however, to the watchful supervision of the Government, spearing is an evil of the past, or at least nearly so, and there is a prospect of our lakes again becoming productive.

The Whitefish(*Coregonus Clupeiformis*) is found in many of the lakes of the Gatineau and Lievre district, where it is both netted and speared, as it rarely takes a bait, and I have never heard of an instance of the true whitefish being thus taken. Its food consists principally of aquatic algœ and small molluscs. I have found remains of the *cyclas* in the stomachs of some I have examined. This fish is too often confounded in name with a fish caught abundantly in the Ottawa in summer, but which is really another genus, being a fresh water herring, or moon-eye, (*Hyodon Tergisus*). This fish affords excellent sport in July and August, taking a grasshopper and worm eagerly. It is very similar to, but smaller than the lake herring (*Hyodon Alosoides*), which is one of the fish of this district, and generally called by the ordinary name of Whitefish.

The Shad (*Alosa Sapidissima*) is another fish which is of doubtful question as coming up the Ottawa above Grenville. They are well known as frequenting the Ottawa up to Carillon, but above that only a stray fish once in a way probably ascends, and the beds of sawdust which extend everywhere above Carillon would hardly invite these delicate fish to pursue their wanderings any further. I find the shad recorded in lists of 1860, but then there was no limit assigned to these lists, simply "fishes of the Ottawa."

We now come to one of the most curious fish peculiar to the waters of this continent, the Gar-fish (*Lepidosteus Osseus*). It is found in the Ottawa River and its tributaries, although far more abundantly in the former than the latter. It is the best living exemplification of the old fossil bony scaled ganoids of Agassiz—fishes clad in a complete suit of enamelled armour, which, beginning in the Devonian

geological system, attained their maximum in Mesozoic times. Hugh Miller in his lectures on geology says, "It would almost seem as if the lepidosteus had been spared amid the wreck of genera and species, to serve as a key by which to unlock the marvels of the icthyology of those remote periods of geological history appropriated to the dynasty of fish." The manner of seizing their prey differs from that usually observed in fishes and resembles that of reptiles; instead of taking their food at once with open mouth, they hold it crossways until by a series of movements it is placed in a proper position for being swallowed in the manner of alligators and lizards. The ball of food is also seen to distend the body as in snakes. The vertebral column of this fish is more perfectly ossified than in any other existing species, and the vertebræ are remarkable as being *opisthocœlian* in type, *i.e.*, hollow behind and convex in front. Its scales are thick, smooth and firmly attached to each other by their upper and lower margins, and of a stony hardness, in fact a perfect coat of mail so thick as to be impregnable to the spear. The jaws are much elongated like the snout of an alligator or a porpoise, and both are furnished internally with rasp-like teeth, and a row of long pointed teeth along their edges. The jaws are hinged together similar to those of the alligator, with the ball and socket jointure. It is a formidable fish and very destructive in its habits. The fishermen when they haul it in with their nets invariably kill it and throw it away. In the young of this species the lateral line is strongly marked and a curious protuberance is visible at the end of the snout. These peculiarities have caused it to be described as a distinct species (*L. Lineatus*), but this is an error. The gar fish was noticed by Charlevoix, who says they not only prey upon fish, but also birds, and he thus describes their mode of capturing them. I give his own description as translated: "Concealing itself among the reeds growing in the marshy border of a lake or river, he thrusts his bill out of water in an upright position. A bird wanting a rest takes this for a broken bough or reed and perches upon it, the fish then opens its mouth and makes such a sudden spring that the bird seldom escapes." The same writer also assures us that the Indians regarded the teeth of this fish as a sovereign remedy for the headache, and that pricking with them where the pain was sharpest, took it instantly away.

Another curious fish, the Burbot, Methy, Dogfish, Ling or Eelpout (*Lcta maculosa*) is found in the bays of the Ottawa, but whether it frequents the river itself I cannot say. I am inclined to think not, as it delights in muddy bottoms and still waters. It is very voracious and destructive to other fish. The candal fin of these fish is almost like a membranous continuation of its body, and with its anguilliform appearance seems to connect other fish with the eel. It attains 2 feet in length. A smaller variety, the lesser burbot, is also found here, but not so abundant, and the only specimen I have come across was a dead one in the lagoon near the mouth of the Lievres.

Eels are abundant, and the common sharpnosed or (*Anguilla Rostrata*) silver eel, so called when taken in running water when it is of a brighter colour, is the only known species here.

Two kinds of Sturgeon frequent the Ottawa, the Lake Sturgeon (*Accipenser Rubicundus*) which ascends the river from its wide lakelike expanses, and the sharp nosed or rock Sturgeon (*Sturio oxyrhynchus*) not so abundant. The bones of these fish are cartilaginous, the back bone, or what would be in another fish the back bone, being a long piece of gristle. The body is studded with rough bony radiated plates and serrated, so that if entangled in a net they are very destructive to its meshes. The flesh of the sturgeon is not appreciated as it should be, as properly cooked it is excellent. Formerly it was called in England the royal fish.

The Lamprey or Lamper Eel (*Icthyomyzon Argenteus*) resembles more in habits the leech, and is a repulsive looking fish in every respect. It has a circular cartilaginous mouth and seven branchial apertures or small round openings on each side of the neck running obliquely from the eyes, in the place of gills. Attaching itself to other fish it draws its nourishment from them by suction, the mouth and tongue—the latter in the throat—acting like the piston of a pump. Dead fish are frequently found with circular wounds on their sides, giving evidence of the cause of death. I think it is not very abundant here, but I have seen it both in the Rideau, Gatineau, the Lievres, and streams running into these rivers. A smaller species, the Mud Lamprey (*Petromyzon Nigricans*) with a cylindrical body compressed at the tail and with sides of an annular or ribbed appearance, might almost be taken for a

large worm were it not for its very small eyes, and fin which commences near the middle of the back, passes round the tail and terminates at the vent. It likes muddy sluggish streams and may be found under stones and sunken logs. Its length is from 3 to 5 inches.

Such is a brief sketch of the fish of this vicinity as far as observed. As our waters may get more polluted in the course of time from population increasing, or from factories discharging their refuse into them, certain fish now found here may become extinct, and it would be curious to know the cause and the time of such an event. Fish cultivation might be profitably carried on in this district, especially that of Bass, Dore, Maskinonge, and the European Carp, which is now largely introduced into the United States. From experiments made during the past few years at Campbell's Bay, it has been proved that waters along the Ottawa, from which sawdust and mill rubbish are excluded, can be utilized for breeding and rearing fish to an unlimited extent. I am informed that many of the bass now in that bay were brought from the Bay of Quinte, or from the Ottawa lakes, Maskinonge from Rice Lake, and Dore from the Detroit River and from Lake Huron. Campbell's Bay being too limited for more than experimental purposes, a series of ponds in some central part of the Ottawa River would be more desirable, if it ever were deemed worthy to utilize for public use the surplus of fish thus cultivated. Nature seems to have provided for this at the Parker Islands, below Thurso, where with a little outlay separate ponds for separate varieties could be kept apart and under thorough control. In fact Mr. Whitcher suggests that an establishment of the kind would be highly interesting to the public, and as these islands are capable of being laid out into recreation grounds, with walks amidst their shade trees and around their ponds, a natural park easy of access to our citizens by water could be established where the observation of pisciculture could be carried on, and from whose ponds the market supply of the poor but industrious fisherman, who make now but a scant livelihood from the Ottawa River, might be increased.

Before concluding I have another idea to touch upon. For many years I strongly advocated the establishment of a National Museum, which is now being brought to a reality in connection with the Geological Museum, and I cannot help thinking that there might be

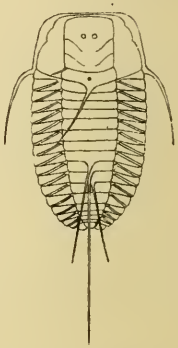
Dendrocrinus jewettii.

Billings 1859

The sculpture of the calyx plates is not preserved in this specimen

Triarthus spinosus

Billings 1857

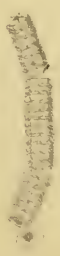


Restored from imperfect specimens

Heterocrinus bellevillensis

n sp

Diagram from another specimen



Side view to show distortion

Front view of the most perfect specimen

Amygdalocystites

Billings 1854

Portion of test of
A. radialis *Billings 1854*
showing position of pores

A. floreatis *var laevis n var*
specimen showing pores

B Billings et W R Billings, del

A. Grignard lith

established at the Capital in connection therewith large aquaria for the display of live fishes from this vicinity, and a working model of a fish hatching apparatus. With the aquaria could also be shown stuffed specimens or models of the chief fish of the Ottawa valley, and the extension of the Canadian Pacific Railway westward opening to us the great basins of Nippissing and Temiscaminge, with their rarer specimens, a central figure of fish life might be constituted instructive to naturalists, attractive to strangers, and always interesting to the people of this city and district.

NOTES ON, AND DESCRIPTION OF, SOME FOSSILS FROM THE TRENTON LIMESTONE.

W. R. Billings.

HETEROCRINUS BELLEVILLENSIS, N. SP.—(*See Plate.*)

Cup about as wide as high, tapering from 0·33 inch wide at top to 0·18 inch at the column.

Basals once and a half as wide as high, five in number, pentagonal.

First radials five, the right posterior and the left anterior pentagonal, the anterior heptagonal, the right anterior hexagonal and the left posterior octagonal; the right posterior supports a hexagonal plate with two upper sloping faces, the right of which supports a range of four primary radials and the left the anal series, the left posterior and the anterior each bear three primary radials and the left anterior and right anterior each four, the upper plate in every ray being an axillary.

The first anal plate is pentagonal, and rests principally on the second plate of the right posterior series, but, slightly, on the first radial plate of the left posterior series; following, and within the cup, are first a hexagonal and then a quadrangular plate, beyond which the exact arrangement is difficult to determine.

Arms ten, robust, rounded on the dorsal side and composed of pieces measuring 0·12 inch in width by 0·08 inch in height at the bases, and which taper upwards until, at a distance of 2 inches, they are 0·06 inch in width by a trifle less in height. In two inches of arm there are 34 pieces. The arm pieces are quadrangular, excepting that those

supporting the armlets are higher on the side of support, and have each an upper corner truncated to provide the necessary bearing for the armlets. The two arms of each ray diverge immediately from the axillary plate upon which they rest, and each arm becomes contiguous with the nearer of those of the adjacent ray ; thus five V shaped spaces are formed filled by the armlets which are restricted to the inner side of each arm—a feature unknown in any species of this genus previously described. Each armlet springs from the upper corner of an armplate, those below from every 3rd or 4th, and above from every 2nd plate ; on each pair of arms the armlets spring from corresponding plates. The armlets are simple 0·04 inch at their origin and decrease to 0·03 inch in a portion of an armlet 0.9 inch long ; the plates are quadrangular, about as long as the adjacent arm pieces, and have a corresponding ratio of reduction.

Column pentagonal, with a central canal of a corresponding shape, but arranged so that the angles of the internal pentagon are opposed to the centres of the sides of the external. There is a line passing from each angle of the canal outwards to the centre of the opposed face and dividing the column into five longitudinal divisions, each of which has a pentagonal section ; each dividing line terminates upward under the centre of a basal plate, and thus each longitudinal division alternates with the basals, which also seems to be the case in *Heterocrinus juvenis*, although the division lines of the column in that species* seem to be from outer to inner angle, and the boundary lines of the canal section to be parallel with those of the exterior. The longest fragment of column I have examined is $2\frac{1}{2}$ inches, and I find the distal two inches to be composed of two alternating series of disks respectively about one-eighth and one-quarter the width of column ; in the half-inch immediately under the cup both series are thinner, the narrower not being properly disks, as each is composed of five smaller pieces, situated one at each angle.

The specimens used in the description are from the Trenton Limestone of Belleville, Ont., where they were collected by Mr. W. R. Smith.

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*Paleontology of Ohio, Vol. 1, Pl. 1, fig. 3c.

DENDROCRINUS JEWETTII.—*Billings, 1859.*

Mr. W. R. Smith has kindly allowed me to examine a very handsome series of specimens of this species collected by him from the Trenton limestone at Belleville, where Col. Jewett discovered the fragment upon which the species was founded. Mr. Smith's are the only specimens of this rare species now in Canada, and they show many new points of interest.

The type specimen wanted the arms, but these specimens have them well preserved. As stated in the original description, each of the primary rays consists of one large plate, included in the cup, and four smaller plates above. We now learn further that the secondary rays are each composed of four pieces, the tertiary of seven, the quaternary of six or eight (they appear variable), while two portions of quinary rays have 16 and 18 respectively. Thus this crinoid has at least forty arms.

AMYGDALOCYSTITES.—*Billings.*

This genus was founded in 1854. In describing it the author invariably stated that the plates were solid or non-poriferous.

In the Trenton limestone at Hull, I collected a specimen agreeing with *A. florealis*, excepting that it is smaller than the type specimen and has smooth plates; this specimen has a poriferous test. The pores are circular and arranged on the sutures, half a pore being on one plate and the remainder on the plate contiguous, and there are as many half pores or sulci to each plate as it has sides, the sulci being subcentrally situated on the sutures. On examining the type specimens of *A. florealis* in the G. S. C. Museum, I found the pores distributed precisely as I have stated, *i.e.*, one to each suture, but Mr. H. M. Ami, who at my request kindly inspected the types, found on one a plate near the base bearing a double quantity of sulci. The type specimens of *A. tenuiradiatus* were not sufficiently well preserved to show the pores, if such existed. I discovered that the type specimen of *A. radiatus* had on each suture two pores near the angles and close to the ends of the radiating ridges, the adjacent pores of three contiguous plates forming a group.

AMYGDALOCYSTITES FLOREALIS *var.* LÆVIS, N. Var.

I propose to separate the Hull specimen as a variety under the name of *lævis*, owing to its smooth plates.

HUDSON RIVER FORMATION CRINOIDS.

I have to record the discovery of *Iocrinus subcrassus*, *Glyptocrinus decadactylus* and *Gl. parvus* in the Trenton Limestone of Brigham's Lake, Hull, where they occur in the same beds with *Glyptocrinus ramulosus*, *Gl. ornatus*, *Dendrocrinus acutidactylus* and other characteristic Trenton forms. So far as I am aware, the three first named have not been recorded from strata of the age of the Trenton Limestone.

THE DUCKS OF THIS LOCALITY.

W. P. LETT.

It is not my intention on this occasion to attempt to offer you anything of a purely scientific character, although it might be no difficult matter in this age of intellectual progress, when standard authorities upon almost every subject of thought are so numerous and so easily available, to deliver a scientific dissertation upon any given theme. From a sportsman's point of view, I prefer, as possibly the more interesting to you and less trouble to myself, to give you my own experience amongst that particular branch of our game birds, the duty of speaking about which has been assigned to me this evening. My experience amongst the wild ducks which visit this part of Canada has been acquired in the bark canoe, amongst the rushes and the rice, and beside the camp fire, where I have passed many a happy day, and many a glorious night—where I have formed friendships which no subsequent combination of circumstances could ever shake. In dealing with our wild ducks, I am quite willing to accord to the canvas-back all the excellences attributed to it, when it has been possible for it to feed upon the roots of the wild celery (*Valisneria*), which impart to the flesh of these fine birds that delicious flavour for which they are so celebrated. After all, however, at the top of the list I feel inclined to place the black duck (*Anas obscura*), not only on account of its size,

but also for its superiority, taken all round, for the table, as well as for the good sport it affords. The black duck is one of the largest of the many species which visit Canada. It generally makes its first appearance here about the 5th April, and remains throughout the summer and until the latter part of October, when it leaves for the South. Should the autumn be unusually mild and free from frost, these birds remain here longer. Few of them are to be met with in the breeding season, which extends from the 20th May until the 15th August, unless in exceptional cases where the eggs have been destroyed by the raccoon and other depredators. The young birds are then unable to fly, and are much more easily approached than at any other season. The black duck feeds in shallow water near the shores of streams, and may generally be found also in small creeks, lakes, and inland ponds. Its food consists principally of seeds, insects, wild rice, and small aquatic plants; and it is also fond of grain of various kinds. Large flocks often resort in spring to stubble-fields for the purpose of picking up scattered grains of the previous year. This bird never dives when feeding, but, when wounded, if, for instance, a wing has been broken, it is one of the most expert and cunning divers to be found. If one be shot on the wing, and falls into the water, as is commonly the case, unless the sportsman is experienced in the business, and is ready with the second barrel, there are ten chances to one against his getting a sight of the wounded bird after the second dive. Under such circumstances the bird will rise to the surface of the water, and the instant it has taken breath, or has fancied itself seen, it will draw its head under water, after the manner of the loon, and sometimes dive 90 or 100 yards. When wounded, however, the black duck always makes for land, where, its direction having been marked, a good retriever will always be certain to find it. I say always for this reason, I once owned a dog—a cross between a thoroughbred cocker and a retriever—that never failed in any single instance to find a bird that I had either killed or wounded. I recommend this breed of dog to every sportsman fond of wild fowl shooting, as superior in all points to any other, and surpassing immeasurably either branch of the parent stock. The black duck is exceedingly wary and difficult to approach, except on shore where the cover is thick. The least noise, the breaking of a twig, or

the rustling of dry leaves, puts them on the alert; and sometimes the appearance of a man at three hundred yards distance will cause them to take wing. The only time at which, by observing great caution, they can be easily approached, is at early dawn, when they repair to their feeding places. They are not then so easily alarmed, and after a short flight frequently alight again. At a later hour of the day—and particularly a fine clear day—when startled, they will rise to a great height, and fly a long distance before pitching again. It is invariably more difficult to approach them after having been once or twice alarmed than at first. The flesh of the black duck, if not superior, is at least equal to any of the larger ducks known in this part of Canada. It is very much superior to that of the tame duck; to which latter in voice, size and shape—although like all wild birds, much finer in the lines of beauty—it bears a strong and marked resemblance. The uniformity in plumage distinguishing the black duck gives it, however, a claim to distinctiveness of species, although it may not be improbable that it has a right in the paternity of some class of the domestic ducks as well as the mallard. The black duck breeds here on the banks of remote streams, small creeks, and lakes. The female lays from twelve to fourteen eggs, and may be seen with a dozen young ones following her early in the month of July. Of this number, probably about six or eight, frequently fewer, arrive at maturity, owing to their exposure to the attacks of the fox, mink, weasel, and the whole family of larger hawks and falcons. When they are first able to take wing the parent birds and the young fly close together, but after having been shot at a few times they separate, and afterwards fly singly or in pairs. Late in the fall, when preparing to migrate, they, however, assemble in large flocks. The best sport in the way of black duck shooting is during the evening flights. In the dusk of the evening they become perfectly fearless of man, and come swooping down on the dead wing into the marsh or rice field within ten or fifteen feet of their enemy. If black ducks are hatched by a domestic hen, they are easily tamed, and become much more docile and much more easily handled than the ordinary tame duck. I once had a beautiful pair which were perfectly tame. I had taught them to come when I whistled. On many an occasion, when out of sight, some hundreds of yards off, in answer to my whistle, I have seen

them sailing home over the tops of cedars in the greatest haste. With the exception of my pet otter, "Pontiac," the two ducks in question were the most affectionate and interesting pets I have ever had in my possession.

In point of standing and respectability, the mallard comes next to the black duck. The mallard *(Anas boschas)* is the original parent stock of the common domesticated duck. The drake of the latter species—wanting only the fineness of outline—bears a complete resemblance to the wild drake or mallard. The females of the wild species are of a uniform grey colour like the plumage of the tame breed. This fine duck is of about the same size and weight as the black duck. It, like the latter, is so generally known as scarcely to require further description. The flesh of the mallard is scarcely equal to that of the black duck, being somewhat coarser in quality. The mallard is a somewhat rare visitant in the Ottawa region. It is quite plentiful, however, in the far western parts of Canada, particularly in the preserved shooting grounds at the "St. Clair Flats." Sir John Richardson says:—"The common wild duck is found in every fresh water river and lake of the United States in winter, but seldom frequents the sea shore or salt marshes. Their summer residence is the north, the great nursery of this numerous genus. Instances have been known of some solitary pairs breeding here in autumn. In England these instances are more common. The nest is usually placed in the most solitary recess of the marsh or bog, amidst coarse grass, reeds, and rushes, and generally contains from twelve to sixteen eggs of a dull greenish white. The young are led about by the mother in the same manner as are those of the tame duck, but with a superior caution, a cunning and watchful vigilance peculiar to her situation. The male attaches himself to one female, as among other birds in their native state, and is the guardian and protector of her and her feeble brood. The mallard is numerous in the rice fields of the Southern States during winter, many of the fields being covered with a few inches of water, and the scattered grains of the former harvest lying in abundance, the ducks swim about and feed at pleasure." The wood duck *(Aix sponsa)*, is smaller by more than one-third than either the black duck or the mallard. The male is one of the most beautifully marked birds of the whole duck genus. In a preserved state it is

generally found amongst the ornamental ornithological curiosities of museums. The wood duck arrives here early in April and remains until the end of October. Solitary birds may, however, be seen at a later period. It breeds in this country, building its nest in a hollow tree, to which the same birds, if unmolested, will return year after year. It derives its name of wood duck from this peculiarity, as well as from its habit of perching on the branches of trees and on the tops of rampikes. This singularity in the character of an aquatic bird is noticeable during the breeding season more than at any other time. These ducks are seldom, perhaps never, seen on trees in the fall of the year. The female boasts of none of the elegant plumage of the male, being simply of a dark brown colour on the back and wings, with white breast and belly in adult birds. She has, however, all the tongue to herself. Her tongue is the loudest and most musical of any duck known in Canada. In their habits, wood ducks are very similar to black ducks, being frequently found feeding together. In common with all non-diving ducks, they feed close to the shore in shallow water. I have often seen them on land, acres away from the water, in search of beech nuts and acorns, of both of which they are exceedingly fond. They are not so wary and difficult to approach as the black duck or the golden eye, although they are constantly on the lookout for danger. In common with all non-divers, the wood duck is fond of wild rice. In the evenings, in September especially, large numbers of them resort to the rice fields to be found in different places on the Ottawa River, when they are shot, and shot at, from boats, canoes, and muskrat houses as they arrive. The flight begins between sundown and dark, and flock follows flock in rapid succession, occasionally until after midnight. Were it not—and very properly so—in direct contravention of the Game Act, excellent sport might be had on a clear moonlight night, as they fly in, perfectly regardless of the noise made by the gun. Having fed throughout the night, the birds leave the rice before daylight next morning to fly to their usual places of resort for miles around ; those only remaining about the place which had been hatched in the vicinity. Although the wood duck never dives when feeding, it is, nevertheless, a cunning and active diver when wounded. It is a fact also well known to sportsmen acquainted with the habits of ducks, that this bird,

as well as some others, when mortally wounded, will, sometimes, dive and seize a weed to which it may be found—providing the water is not too deep—firmly clinging after death. The female wood duck, shortly after hatching out her young, conveys them from her high nest to the ground or water, as the case may be, by seizing them with her bill. When surprised and alarmed the young ones hide and remain in concealment until the danger is over, which they are made aware of by the voice of the parent bird calling them together. In the moulting season the male bird loses his fine variegated tuft; but he may still be distinguished from the female by the white and rose colours of his bill, as well as by the well defined outlines of the rich and brilliant hues peculiar to his head and sides. When caught young, this beautiful duck is easily tamed, and becomes quite familiar with the person by whom it is usually fed. I kept one that I had slightly wounded for two years, during all of which time it remained in all the gorgeous beauty of full plumage. It subsisted chiefly upon Indian corn, of which it seemed very fond. The habitat of the wood duck may be said to cover all parts of Canada and the United States. No one of the wild fowl family is better known to sportsmen. In addition to the great beauty of its plumage, its flesh is fully equal in flavour and delicacy to to that of the black duck or the mallard. The wood duck flies, particularly down the wind, with great swiftness, and the sportsman, who, under such conditions can knock over one with each barrel, going at the rate of eighty miles an hour, has no reason to complain of the quality of his gun, or the straightness of the eye that looks over the barrels. The specific name of the wood duck is *sponsa*, a bride. Why given it is hard to tell, unless its gorgeous plumage may be considered symbolical of the spousal array of some fair one decked out in the glory of her wedding garments. Next in order comes the green winged teal, so called from the large beauty spot on each wing. The green winged teal (*Querquedula carolinensis*) makes its appearance in this part of Canada in small numbers, early in the month of April. The male bird is beautifully marked, the head being of a glossy reddish chestnut, with a broad band of silky green running from the eye backwards to the nape, edged above and below by a fine line of brownish white. The female is destitute of this ornamental plumage, being simply a little

grey bird with dark round spots on the breast. Both male and female have a large green speculum on the wings, from which the name is derived. The flight of these birds is exceedingly rapid and irregular, and their mode of alighting sudden and abrupt. They are very easily approached and do not exhibit so much alarm at the proximity of man as many of the larger species. Their note is a hoarse quack, which, however, is seldom heard except when they are suddenly alarmed and put to flight. It is very doubtful whether they breed in this part of Canada. It is certain, however, as far as my experience can determine, that young broods are never seen here. The green winged teal resorts chiefly to inundated lands in the spring, and to shallows near shores and adjacent to rapids in the autumn. They do not dive when feeding; but when wounded are almost equal to the loon or the golden eye under water. The blue winged teal (*Querquedula discors*) is seldom seen in this neighbourhood until late in the season. It arrives about the 15th September, and then, as a rule, only in limited numbers. An old male bird of this species is nearly as large as a wood duck, although much shorter in the body and neck. They are commonly seen in flocks of from eight to twelve feeding on low marshy ground and along the shores of streams. In exceptional seasons, I have seen flocks of blue winged teal containing upwards of two hundred. This occurred on the River Goodwood one afternoon late in September, about fourteen years ago. They did not all get away; for, during part of the day, I killed fifty ducks, and paddled my own canoe in a stiff breeze into the bargain. The flight of the blue winged teal is very rapid, like that of the pigeon; and when about to alight they drop down suddenly like a snipe or a woodcock. As a rare delicacy the flesh of this bird is unsurpassed, if it is equalled, by any bird of the duck family. In habit, the blue winged teal is identical with the black duck, the wood duck, and the green winged variety, in diving only in sport and when wounded. These birds may frequently be seen in company with the black ducks. I remember having on one occasion knocked down two black ducks and three blue winged teal at one discharge. On several other occasions I have killed a mallard, a black duck, and a wood duck at a single shot. If not much disturbed, the blue winged teal is comparatively easy of approach; consequently it falls an easy prey to the gun of the sports-

man. The male and female differ but little in plumage—both being of a light grey colour above, and mottled with dark specks underneath. The wings are marked with a large patch of light blue, from which feature it gets its name. In shape and general contour it is precisely similar to the black duck, and in habits much the same, both delighting to feed along muddy shores. These birds are very numerous in Manitoba and the North-West, where very few of our black ducks are to be met, although mallards are extremely abundant. Like the green wing the blue wing has a harsh discordant voice, hence its latin designation, *Discors*. Next to the eider duck perhaps the blue winged teal may be said to fly with greater velocity than any other. Going down the wind, it sometimes puzzles the quickest hand to get the muzzle in the right place. I have seen one of these birds killed dead—and that is a sporting phrase—fall and strike the water twenty yards beyond a perpendicular descent. Like the black duck, the wood duck, the mallard, and the green winged, the blue wing is fond of sitting on logs or on shore in some secluded spot in the heat of the day, at which time it is much more difficult to approach than when found feeding or listlessly sitting on the water. Next in order, or perhaps among the first that ought to have been mentioned in the list of non-divers, is the pintail (*Dafila acuta*), the most elegantly formed and most graceful of all ducks. The male pintail is a beautiful bird. Its colour is a variegated grey on the back and sides, belly white, head a rich brown with a white line on each side, commencing at the back of the neck and widening with a graceful curve into the white plumage of the breast. The pure whiteness of the belly terminates against a black velvety bar underneath the root of the tail. The beauty spot on the wing is black, striped with fine lines of white formed of loose crest-like feathers. The female is simply a sober grey colour, of a much more beautiful hue, however, than that of the female mallard. These elegant birds are rare visitors here, being only occasionally seen in spring during high floods, and in the fall. Their habits are similar to what I have already mentioned as the characteristics of the non-diving varieties. I may mention here that, three years ago, I shot a magnificent specimen of the male pintail, at the mouth of Brigham's Creek, which I have had stuffed and set up, and which, for style and beauty, it would be difficult to surpass. The

redhead (*Fuligula ferina americana*) is a rare visitant on the Ottawa in the spring. They are, however, to be found in considerable numbers about Black Bay, near the mouth of the North Nation River, in the fall. The body of the male bird is of a blueish-grey colour, the head red, the breast and the lower part of the neck black. The plumage of the female—as is generally the case amongst birds—is much less attractive than that of the male. The red head and the silky black band around the breast are wanting in the female. The redhead is a large heavy duck, and is considered excellent for the table. Large flocks of these birds frequent Chesapeake Bay, in the United States, where they watch the canvas-backs when the latter are diving for the wild celery. After a long dive, the instant the canvas-backs emerge, the redheads rush at them and rob them of the fruits of their labour. The canvas-back eats the root only of the *valisneria*, while his plunderer—pirate as he is—devours both the roots and the leaves of the plant. Like the canvas-back, the redhead will eat little of anything else while it can get the wild celery, which causes the flesh of the latter almost to rival in delicacy of flavour the former celebrated bird. The sheldrake, goosander or water-pheasant (*Mergus merganser*) is the largest and heaviest of the mergansers to be met with here. The male of the largest size frequently reaches the weight of five pounds. In spring, when the plumage of all wild ducks is most beautiful, the male of this species is black on the back, breast and belly a rich cream colour, head and neck a dark glossy green. The bill is long, narrow, strongly serrated, with a crimson line running from the base to the point on each side. The female is much less gorgeously arrayed. She is of an uniform light slate colour on the back, white belly, and rusty coloured red head, slightly tufted. In the fall the male bird appears in the less attractive livery of his mate. These birds make their appearance here early in the spring in the first open water, and remain until the ice warns them to depart. Many, however, remain all winter, and may be seen with the golden-eyes in rapids and at the foot of waterfalls. Next to the loon, or the red-throated diver, the sheldrake takes the front rank in capacity for speed and endurance under water. The sheldrake subsists upon fish, consequently its flesh has a fishy flavour, which requires some knowledge of cookery to overcome. I have seen twelve

or fourteen of these birds diving in a sort of semicircle towards a small bay or indentation of the shore. As they approached they made quite a noise by fluttering while on the surface of the water. They were driving before them a shoal of small fish. When they got the fish crowded together in the little inlet, they plunged down amongst them, and the slaughter began. I shot one of the largest of the birds ; and when brought to land by my dog, I noticed a sucker about six inches long in his throat ; I took him by the legs and gave him a smart snapping shake, and out came the sucker accompanied by five or six minnows about four inches in length. I continued the shaking process, and finally managed to bring to light no fewer than sixty-eight of the smaller fishes in addition to the sucker. Mr. J. T. Coleman, the city taxidermist, has informed me that he once captured a sheldrake which appeared to be in a dying condition, and found that the bird had swallowed a large mudpout, the lateral horns of which had pierced the skin on each side of the gullet and disabled him. I kept a sheldrake an entire summer, and after he had devoured, as closely as I could calculate, nearly 4,000 small fish, chub, rock bass, black bass, perch and sunfish, he dived out of existence in the attempt to bolt a rock bass as large as my hand. These facts go to illustrate the extreme voracity of this king of the mergansers. The merganser is a fearless bird, seldom turning out of his line of flight to avoid man, and, compared with other ducks, somewhat slow on the wing. The sheldrakes breed on the tributaries of the Ottawa River in considerable numbers. Like wood ducks they build their nests in hollow trees, although they are never seen perched on trees like the former. The young broods may be seen following the mother in the month of June. When pursued they dive and make for land, where they hide in the brush ; whence they emerge again at the call of the parent bird. In contradistinction to the habits of the non-divers, the mergansers, excepting under the circumstances I have mentioned, never take refuge on land. The young sheldrakes, when well grown into the flapper transition, will skim over the top of the water at the rate of twelve miles an hour, rapids and chutes being but trifling obstacles in their way. The red-breasted merganser *(Mergus serrator)* is a very rare stranger on the Ottawa or any of its tributaries. It is a much smaller bird than the sheldrake. The male bird is black on the back and wings, with a red breast and

part of the neck and head black, the latter being crowned with a jet black crest of fine hair-like feathers. The female is of a brownish dark slate colour on the back, belly white, head light brown, and is much smaller than the male. The food, habits, etc., of this bird are identical with those of the sheldrake. The hooded merganser *(Mergus cucullatus)* makes its appearance here about the first of April, or as soon as it can find open water along the shores to feed in. This bird is considerably less in size than the red-breasted variety. The male bird is one of the most beautiful of ducks. The back is black, sides elegantly variegated, belly white, neck and head jet black. The head is adorned with a stately crest of white, semi-circular in form, bordered by a well defined band of black. This magnificent crest can be raised or lowered at pleasure. The female is more plainly attired, being merely of a dark brown on the back, with white belly and a dusky coloured crest of hair-like feathers. Unlike the other mergansers this bird has a yellow eye, and the wing speculum is white. The hooded, or crested merganser as I should prefer calling this beautiful bird, is an expert diver, but instead of fish it feeds on insects, larvæ and, probably, wild rice. Its flesh is not fishy in taste, still it is not equal to that of the better classes of the non-divers. These birds breed here. When not feeding they swim close together, and fly also in a compact manner. Their favourite feeding places are along shores under overhanging bushes. The golden-eye *(Clangula glacium)*, deriving its name from the loud whistling sound made by its wings when flying, belongs to the sub-family *fuliguline* or sea ducks. The golden-eye is widely distributed over every quarter of the globe. It is well known in the Arctic, as well as the Antarctic Ocean. The clear whistle of its wings can be heard by the Icelander as well as by the Patagonian—by the borderer of Cape Clear and the climber of the cliffs of the Orkneys—by the Esquimaux of Hudson's Bay and the dweller on the shores of the Gulf of Mexico—by the British Columbian and the New Zealander. Wherever open water along a coast can be found, the golden-eye, at some season of the year, makes its home. No aquatic bird is more generally known to sportsmen and ornithologists than the golden-eye. The golden-eye is a bold and strong diver, feeding frequently in water twenty feet deep. Many of them remain in this part of Canada all winter, frequenting rapid open

water wherever they can find it. They feed on aquatic insects, larvæ and wild rice; and doubtless make considerable havoc amongst the spawn of fish. Although much shorter in the body, specimens may sometimes be found almost as heavy as a black duck. The flesh is destitute of the fishy flavour peculiar to the sheldrakes; still it is much inferior in this respect to any of the non-divers. These birds are exceedingly wary and hard to get at. The run-at-the-dive dodge is the best mode to approach them. I am not aware of their breeding here. The male golden-eye—only to be found in full plumage in the spring—is beautifully white underneath, with black wings and white beauty spot. The head is dark green with a small white spot on each side at the root of the bill. The female is bluish black on the back, white belly and head of dark dusky brown. The buffle-head (*Clangula albeola*) is the smallest of the divers. The male is elegantly marked. The belly is dusky white, quite silky in appearance. The wings and back are black. The head is purplish green, with a large white spot on each side. The legs and feet are of a delicate flesh-colour. The female is simply black and white with small white spots on the head. These elegant little ducks are excellent eating. They are so fat that in the United States they are called "butter balls." The buffle-head is a good diver. Like the bluebill, it prefers broad open water to creeks or small streams. The American widgeon (*Mareca americana*) is a handsome bird of the non-diving variety. It is slightly larger than the wood duck. The male bird has elegant plumage of a creamy red colour on the sides and front of the breast. The belly is white, and from a white spot on the top of the head it gets the name of "baldpate." The female is grey on the back, sides and breast of a reddish hue, and belly white. They are rare here in spring, and not at all numerous in the fall. I saw a very fine specimen which was shot by Mr. Whitcher at Lochaber Bay last fall. The flesh is highly esteemed. The greater bluebill (*Fuligula marila*) and the lesser bluebill (*Fuligula affinis*) are both to be met with in considerable numbers on the Ottawa in the fall, although very few of either kind are to be seen in that river or its tributaries in the spring. Both varieties are short and thick-bodied, white bellied in part, dark brown on the back and breast. They may easily be distinguished by the blue colour of their bills. They are expert divers, and feed on

the *valisneria*, when they can get it. They are also very fond of the larvæ of the dragon-fly, to be found in great abundance at the bottom of streams near shore. The bluebills, like the canvas-backs, are only superior to the better classes of the non-divers when they can obtain the wild celery. They are also fond of wild rice, amongst the stalks of which they may be seen constantly diving late in the fall. The "ca-ca-wee" (*Harelda glacialis*) or "old wife," is a diver which comes from the north in the spring, passing down the Ottawa when the water is at its greatest height, resting here and there for a day, and following the flood down to the Gulf, or perhaps to the open sea. This bird gets its strange name from the notes of its voice. Its cackling may be heard quite a distance off. I have seen them frequently, but have never had an opportunity of examining a specimen. There are other ducks which occasionally visit the Ottawa river, the habits of which I have not yet had an opportunity to observe.

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REPORT OF THE GEOLOGICAL AND MINERALOGICAL BRANCH FOR THE SEASON OF 1882.

To the Council of the Ottawa Field Naturalists' Club :

The leaders of the Geological Branch of the Club beg to report that although no regular sub-excursions of the Club in this branch were held, still small working parties made constant investigations into the numerous palaeozoic exposures in the neighbouring districts. Notes on the most interesting sections and measures were taken, which, when the long needed accurate topographical map of the district is prepared, may prove of no little value in determining the relative ages and exact distribution of the various formations met. The following brief notes of observations made are now submitted as likely to prove of more immediate interest :

The Chazy Formation.—I. Quite an extensive patch of this formation was examined at the Club's second excursion to the Des Chênes Rapids, three miles below Aylmer, P.Q. These measures consist of

light yellowish-grey sandstones, underlaid by dark bluish green arenaceous shales of a rather brittle nature. The rapids here doubtless owe their origin to these softer shales, which have been denuded and washed down the river. A few fossils were found in a stratum of rock which was ferruginous. The beds are almost horizontal, dipping very slightly to the west, and extend quite a distance west, south and east of this exposure, being well exposed at Aylmer and Britannia, as well as at Skead's Mill, where there is a quarry of building stone from which many of the finest edifices in Ottawa have been partially or wholly built.

II. Another interesting exposure of this formation, doubtless connected with that just described, occurs on the south-western shore of McKay's Lake, New Edinburgh, the strata here being but little superior stratigraphically to those at Des Chênes. This is brought to sight by an extensive fault running in an easterly direction across the measures of the Cambro-Silurian formations here, and referred to in the Geology of Canada, 1863, a downthrow on the north side of the fault being clearly shown. Altogether, the beds form a thickness of some 20 feet, and appear quite destitute of fossils; the upper measures consist of a very brittle series of greenish-grey argillaceous shales which cleave at all angles and disintegrate to some extent. This exposure is part of one of two anticlinals, the other being at Hog's Back, in Nepean, Ont., while in the synclinal basin between them are comprised the Black River, Trenton and Utica formations, together with the Pliocene and drift deposits.

III. The summit of the anticlinal at Hog's Back, Nepean, has been denuded and broken, a fault of several feet—again a downthrow on the north-eastern side of the fault—occupying the place where the rocks were rent. Here the sandstones predominate, and but very few shales occur. The hard quartzose beds pass from areno-argillaceous shales to calcareous sandstones, whilst the latter are immediately overlaid by limestones holding numerous fossil organisms. A band of the most argillaceous sandy beds yielded great numbers of the typical species *Lingula Belli*, (Billings), also an abundance of a lamellibranchiate mollusca, which may prove very interesting to palaeontologists, as

these bivalves are exceedingly rare throughout this formaton. In last year's report this exposure was erroneously referred to the calciferous formation.

The Trenton Formation.—A fine section of the lower measures of this formation was observed and paced. It was some sixteen hundred feet in length, situated on the western extension of the Canadian Pacific Railway, a short distance from the Union Station, where a denuded anticlinal is exhibited. The dips in different parts of the section were ascertained and noted, as also the strike and the fossils observed. The dips were found to vary from 8° to 48° on the eastern side of the section.

The Utica Formation.—On the right bank of the Rideau River, opposite the Rifle Range, an exposure of this formation, worthy of note on account of its lithological character, was observed. Besides the ordinary bituminous shales there occur, interstratified in a section some 12 feet in thickness, ten or more bands of impure limestone, in some parts assuming a nodular character, in others very compact, varying from 2 or 3 to 10 inches in thickness. These hold a large number of fossils, as a rule very different from those in the overlying and underlying shales. Whilst the shales hold numerous specimens of *Asaphus Canadensis* (Chapman), associated with *Triarthrus Becki* (Green) and orthids, the bands of limestone teem with *Conularia Trentonensis*, *Zygospira Headi ?* (Bill.), *Calymene senaria* (Conrad), and other forms of life. It was in one of these bands of impure limestone, or one belonging to this series that *Siphonotreta Scotica* (Davidson), a prettily fringed Brachiopod, was found by Mr. J. W. H. Watts, R.C.A., its occurrence for the first time on this continent having but recently been made known to science by Mr. J. F. Whiteaves in a paper read before the American Association for the Advancement of Science in August 1882.

The whole respectfully submitted,

(Signed) WM. P. ANDERSON,
H. M. AMI,
H. WATTERS.

19th January, 1883.

REPORT OF THE PALÆONTOLOGICAL BRANCH FOR THE SEASON OF 1882.

To the Council of the Ottawa Field Naturalists' Club :

The first excursion of the Club last season to the Laurentian Mountains at Chelsea of course afforded no opportunities for collecting fossils. At the DesChênes Rapids, where the second excursion was held, the sandstones of the Chazy formation proved very unfossiliferous, but by careful search Mr. H. M. Ami detected some specimens of *Orthis imperator*, Billings, and of the characteristic *Rhynchonella plena*, Hall.

The visit to Brigham's quarries, at Hull, on the 21st October, was made too late in the day, and too late in the season, to permit of full justice being done to this long known and favorite locality for collectors. These quarries are remarkable for the number and variety of the fossils found in them, on the weathered surfaces of slabs of Trenton limestone, and are specially rich in crinoids and monticuliporids. Stems of *Glyptocrinus* more than eight feet in length were observed in one part of the quarry, and fine examples of *Glyptocrinus ramulosus*, Billings, showing the heads and pinnulæ in a fine state of preservation, were also collected. Among other choice specimens obtained by members of the Club was a slab, showing a good example of the head and column of *Dendrocrinus acutidactylus*, Billings, surrounded by young *Glyptocrini*, both in an excellent state of preservation. The following is a list of the species collected on this particular occasion :

PROTOZOA. Stromatocerium rugosum, Hall.

CRINOIDEA. Glyptocrinus ramulosus, Billings, and G. decadactylus, Hall; Dendrocrinus acutidactylus, Billings; Heterocrinus subcrassus, Meek & Worthen.

POLYZOA. Arthoclema pulchellum, Billings ; Stictopora acuta, Hall, and Ptilodictya falciformis, Nicholson ; Prasopora Selwynii, Nicholson ; Monotrypella Trentonensis, Nicholson.

BRACHIOPODA. Rhynchonella capax, Conrad, var. increbescens, Hall, and R. recurvirostra, Hall ; Orthis testudinaria, Dalman ; Strophomena alternata, Conrad ; Streptorhynchus filitextus, Hall ; Leptæna sericea, Sowerby.

LAMELLIBRANCHIATA. Ctenodonta nasuta, Hall.

Pteropoda.	Conularia Trentonensis, Hall.
Gasteropoda.	Murchisonia gracilis, Hall.
Cephalopoda.	Endoceras proteiforme, Hall.
Annelida.	Serpulites dissolutus, Billings.
Crustacea.	Encrinurus vigilans, Hall.

Last summer Messrs. W. R. Billings and H. M. Ami paid special attention to collecting the Monticuliporidæ of the Black River and Trenton limestones of the neighborhood of Ottawa, and succeeded in finding six species that had not previously been recorded as occurring in Canada, and four that are new to science.

The six new to Canada are as follows :

Ptilodictya pavonia, D'Orbigny.
Ptilodictya maculata, Ulrich.
Stictopora paupera, Ulrich.
Monticulipora parasitica, Ulrich.
Amplexopora discoidea, Nicholson (Sp.)
Heterotrypa solitaria, Ulrich.

The four new to science have recently been described by Mr. A. H. Foord, in one of the publications of the "Geological and Natural History Survey of Canada," as *Monticulipora Billingsi, Prasopora oculata, Batostoma Ottawaense and Spatiopora areolota.*

During the season of 1882, also, Mr. W. R. Billings has made the following additions to the Fauna of the Trenton limestone near Ottawa City.

Celenterata.	Palæophyllum divaricans, Nicholson.
Crinoidea.	Glyptocrinus decadactylus, Hall.
	Glyptocrinus parvus, Hall.
	Heterocrinus subcrassus, Meek & Worthen.
Annelida.	Conchicholites flexuosus, Hall.

From the Chazy formation at the Hog's Back, Messrs. Billings and Ami have obtained an interesting series of fossils, but these specimens have not yet been studied nor the species identified.

Mr. E. T. W. Sowter reports the discovery of considerable areas of Black River limestone, containing well preserved and characteristic fossils, between Aylmer and the mountains to the north, also to the N. W. of Aylmer, in a tract of country previously laid down on the maps as exclusively occupied by the Chazy formation.

Finally, specimens of a rare spinose brachiopod, belonging to the genus *Siphonotreta* of De Verneuil (a genus not known to occur in North America), and referable to a Scotch species, the *S. Scotica* of Davidson, have been collected by Mr. J. W. H. Watts, in the Utica Slate formation near Cumming's Bridge. A paper descriptive of these specimens was read before the Geological Section of the American Association for the Advancement of Science, at its last meeting in Montreal.

J. F. WHITEAVES.

W. R. BILLINGS.

16th February, 1883.

REPORT OF THE BOTANICAL BRANCH FOR THE SEASON OF 1882.

To the Council of the Ottawa Field Naturalist's Club :

During the season just concluded, the Botanic section has continued the system inaugurated during the previous year : imparting information, bringing together those interested in the work, forming sub-excursions and working parties, being the chief duties your committee has kept in view.

The work in this branch has progressed steadily. Our knowledge of the 'Flora' of this district has been increased by the discovery of new specimens and finding new localities for old ones, but none of the systematic observations commenced are sufficiently complete to add to this report.

A pleasing feature has been the frequency with which information has been sought by members, not only by those who are actually engaged in collecting and preserving specimens, but also by those whose duties will not permit them to devote much time to the study of natural history. Several additions have been made to the working members, many being beginners. Professor Macoun, hitherto one of our corresponding members, has removed to this city and entered into active membership. His botanical knowledge and extensive collection will be welcomed by this branch, while his well-known energy cannot but add

to the success of the Club. The presence in this city, for some weeks, of Professor Fowler, of Queen's University, Kingston, was a source of much pleasure and profit to our botanists.

The prizes offered by the President have not received the attention they deserved. For the best collection of local plants, only one of the many beginners has persevered in preparing a collection for competition; but this one, numbering 257 specimens, has been so correctly prepared that it is well worthy of the prize, and we have much pleasure in recommending Mr. T. J. MacLaughlin for that honor. For the greatest number of additions to our published list we are of opinion that no prize should be awarded. A few have competed, but the President—although not a competitor—has added more than five times as many as all others.

The number of new plants this year is 24, a very satisfactory result when we remember that this is the fourth year since the "Flora Otawaensis" was published. In the list this year, you will find the name of the discoverer added to each plant, so that anyone desiring duplicates may know to whom he should apply. For the first time, we notice with pleasure the name of a lady who has added to our list of new plants; it is to be hoped that during the coming year others will follow this example and some of them succeed in carrying off prizes.

It is greatly regretted that the Club excursions have not been more numerous, as this is the most favorable means we possess of bringing together workers and non-workers, and, possibly, of awakening some dormant talent for natural history.

Sub-excursions were held frequently throughout the summer; regular morning expeditions were made, and individual efforts have been prosecuted with so much zeal, that there is no available locality that has not yielded something new.

At the excursion to Des Chênes Rapids *Carya alba* and *Potentilla Canadensis* were added to our list. The former—which produces the sweet hickory nut—is of interest, as this is the most northerly and easterly point where it is recorded as growing. On the sandy islands above Aylmer two grasses were discovered—*Andropogon furcatus* and *Sorghum nutans*, also near the same spot *Lithospermum hirtum*. In the ravine near Old Chelsea the walking-fern, *Camp-*

tosorus rhizophyllus, was found; hitherto this had only been obtained from the rocky ridges on the south bank of the Ottawa, below the city. In Hull, near Lake Flora, *Muhlenbergia Mexicana* and *Rhus aromatica* were discovered. Near the mouth of the Gatineau River *Iris tenax* was gathered. This is a very rare plant, being a native of the Southern States; it has never been previously recorded as growing in Canada, and Gray does not mention it as being found in the northern United States. The neighborhood of Lake Wyndiago has contributed *Melampyrum Americanum*. In the spring *Ranunculus Cymbalaria* was found at Thurso growing in low clay meadows in great profusion. This is a curiosity, as its natural habitat is along the sea coast and in the neighborhood of salt springs. A special study of the maritime plants which occur in this locality would form an interesting subject for some of our members. Several have already been observed; some of you will remember the *Triglochin maritimum* var. *elatum* found in the Mer Bleue on one of our excursions. Near Hemlock Lake two rare ferns were discovered, *Pellæa gracilis* and *Ophioglossum vulgatum*; here, also, *Daphne mezereum* was seen growing. This last is not a native of America, but two bushes were found by different members of the club growing wild, one in the woods behind Rideau Hall, and the other in fine fruit among rocks by Hemlock Lake. Some years ago two bushes were found on the top of Mount Royal, Montreal, far from any residence or thoroughfare. The bushes were noticed upon more than one occasion, and to judge from their size and their rootstalks were of great age. At Billing's Bridge *Viola pubescens* var. *scabriuscula* and *Celtis occidentalis* were observed, of the latter only three or four trees grow here, and we are informed by Professor Macoun that with the exception of a grove of six at Belleville, none others are known east of Hamilton. The occurrence of such solitary specimens of full grown trees introduces a subject for speculation. Are they chance introductions, or are they remnants of a previous flora? Dow's swamp has proved almost an inexhaustible hunting ground. Here was found that great rarity the Ram's-head orchid *Cypripedium Arietinum* which was found in great profusion within a limited area. In the same place two other rare orchids were found in large numbers *Habenaria rotundifolia* and *Microstylis monophyllos*. It is curious that this last species

should have been found so plentifully this year, while of *M. ophioglossoides*, which in previous years had been obtained in large numbers, only one specimen was found. This habit of appearing in large numbers and then disappearing is peculiar to some families especially Orchids and Aquatics. Good collections were also made of *Aspidium cristatum var. Clintonianum*. In the Rideau Canal Mr. Fletcher found *Lemna minor* flowering profusely, the first date on which it was noticed was the 5th July. This has not previously been recorded as having been found in flower in Canada. At the same time the form of *Potamogeton Vaseyi* with emersed leaves was found in fruit; some good specimens were obtained, but a large proportion was found to be infested by a parasitic fungus. A few poor specimens taken from dried plants were sent to Professor Farlow, of Harvard University, who replied concerning it: "The specimens are very interesting. The fungus is something "which I have never seen before, and which, as far as I can ascertain, is "as yet undescribed. It is probable that it belongs to the *Ustilagineæ* "but it is possible that it belongs to a new genus." The study of these parasitic fungi is at the best very difficult, and can only be done satisfactorily from fresh specimens and in larger quantities than were sent to Professor Farlow. A peculiar form of *Potamogeton pusillus* with small emersed leaves was noticed, this form the Rev. T. Morong pronounces as very similar to the Sicilian variety of *P. pusillus* called *panormitanus Biv.* Three or four expeditions were made to the Mer Bleue with good results, large collections being made of *Eriophorum vaginatum*, *Carex pauciflora*, *Carex limosa* and *Carex exilis*. The last named has not before been noticed in Canada, it is a species common along the base of the White Mountains and very probably it will be found between this locality and its native habitat.

In conclusion, we appeal to the members generally to make more notes for the benefit of the committee. The earliest date that leaves were noticed on certain trees, or the first and last appearance of any of our wild flowers, may appear of little value, yet, when added to the observations of others, may prove a very useful contribution to science.

R. B. WHYTE.
BEAUMONT SMALL, M.D. } Leaders.

APPENDIX.

Flora Ottawaensis ; Additions to Previously Published Lists.

Ranunculaceæ.		
Ranunculus Cymbalaria, Pursh (leaves).	Mr. Fletcher,	May 24
Cruciferæ.		
Cardamine rotundifolia, Michx.	"	" 17
Violaceæ.		
Viola pubescens, v. scabriuscula, T. & G.	"	" 20
Anacardiaceæ.		
Rhus aromatica, Ait.	Mr. H. M. Ami.	June 2
Rosaceæ.		
Potentilla Canadensis, L.	Mr. Fletcher,	Sept. 2
Rubiaceæ.		
Sherardia arvensis, L.	Mr. H. M. Ami.	July 24
Compositæ.		
Ambrosia trifida, L.	Mr. Fletcher,	Aug. 25
Helenium autumnale, L.	Mr. H. M. Ami,	Sept. 25
Scrophulariaceæ.		
Melampyrum Americanum, Michx.	Dr. Small.	July 22
Borraginaceæ,		
Lithospermum hirtum, Lehm.	Mrs. Chamberlin.	Aug. 20
Polygonaceæ.		
Rumex Britannica, L.	Mr. Fletcher.	Sept. 15
Thymelaceæ.		
Daphne Mezereum, L.	Mrs. Chamberlin,	May 15
Urticaceæ.		
Celtis occidentalis, L.	Mr. Fletcher,	" 15
Juglandaceæ.		
Carya alba, Nutt.	"	Sept. 2
Orchidaceæ.		
Cypripedium arietinum, R. Br.	"	June 12
Iridaceæ.		
Iris tenax.	"	July 21
Cyperaceæ.		
Carex exilis, Dew,	"	June 17
" aperta, Boot.	"	July 30
Gramineæ.		
Muhlenbergia Mexicana, Trin.	"	Aug. 20
Andropogon furcatus, Muhl.	"	Sept. 28
Sorghum nutans, Gray.	"	Sept. 28
Filices.		
Pellæa gracilis, Hook.	Mr. R. B. Whyte.	July 1
Aspidium cristatum, v. Clintonianum, Gray.	Mr. Fletcher,	July 31
Ophioglossum vulgatum, L.	"	July 15

REPORT OF THE CONCHOLOGICAL BRANCH FOR THE SEASON OF 1882.

To the Council of the Ottawa Field-Naturalists' Club.

I regret exceedingly that circumstances have for the present caused the withdrawal of my colleague, Mr. Latchford, from active work in the Club, and although much the larger proportion of the work to be recorded was done by, or at the instigation of, that gentleman, the preparation of the report from this section falls to my lot.

During the past season several excursions have been organized, and a considerable amount of work accomplished. The number of interesting species noted, however, has been smaller than might have been expected; nevertheless good series have been collected of forms heretofore considered rare in this locality, such as *Unio pressus* which was found in considerable numbers by Mr. Latchford and Mr. Tyrrell in the Rideau River, by the Rifle Range. Some interesting varietal forms of *Goniobasis livescens*, Menke, have also been secured.

The same gentlemen made a very successful excursion to Meech's Lake, in the month of September, when, among other species, good collections of *Limnæa megasoma*, *Physa Lordi* and *Anodonta fragilis* were obtained.

The last named species was found to be badly infested with parasitic mites, one of which, found in the gills of the mollusc, and as yet undescribed, was remarkable for its extraordinary size, being of the dimensions of a large marrow-fat pea.

Some nice specimens of *Mesodon Sayii*, Binney, were found by Mr. Latchford near the Beaver Meadow in Hull, in November; and another beautiful shell, which has, for the present, been referred to *Succinea aurea*, Lea, was also discovered. It is possible, however, that it may only be the young of *S. ovalis*, Gould.

A large *Limax* resembling *L. agrestis*, Say, was likewise detected in a garden inside the city limits; but its identity is not certain.

It is right to mention that a collection of specimens, which has been sent to specialists in the United States, has not yet been returned, and which, when received, will add some new species to our local list.

Owing to the height of the water in the Ottawa River, the past season has been a very unfavourable one for collecting *Unios*.

2nd February, 1883. PASCAL POIRIER.

REPORT OF THE ENTOMOLOGICAL BRANCH FOR THE SEASON OF 1882.

To the Council of the Ottawa Field-Naturalists' Club.

As this Report is intended to be but a brief outline of the work of the Club during the year, it must necessarily deal with generalities rather than with the details which might be looked for as desirable in an ordinary entomological paper.

It is much regretted that the number of workers in this Branch has been but slightly augmented since the organization of the Club, and that in consequence the collections in the different orders progress but slowly, while some are almost totally neglected.

The season opened much later than in 1881 and quantities of snow and ice remained in the woods on 7th April, while even in May there was a snow-fall on the 2nd and several frosty nights during the early part of the month. Consequently there was no great abundance of insect-life until toward the middle of May, but from that time the season was a favourable one for collecting, and specimens were numerous to the end of October. Collections were made at each of the three Club Excursions, and sub-excursions also visited Thurso, the Mer Bleue, Chelsea, McKay's Bush, Templeton, Billings' Bridge, etc. The most important work, however, was done by individual members.

It is thought desirable to indicate the relative attention which the several orders have hitherto received, and they are therefore treated separately. Unfortunately the extensive collections made in this vicinity by the late Mr. Billings have been interspersed with numerous species received from other localities, and are therefore unavailable for the compilation of our lists; thus the whole ground has to be covered afresh.

Hymenoptera.—This order, containing our bees, wasps, ants, etc., offers perhaps more inducements to the student of insect life (not the mere collector of insects) than any other, and it is much to be deplored that so little is yet known of our species. We have no worker devoted to this order, and although a considerable number of species have been collected, and are available for study, but few have yet been named. The only group to which particular attention has been devoted is the Urocerida, or Horntails. Several species are found here destroying our

trees, and some notes on them have been recently published in the Canadian Entomologist (Dec. 1882) to which members are referred for further particulars.

Of the Tenthredinidæ, or Saw-flies, some ten or more species are so far known. This is a very obnoxious group of insects and should therefore be carefully investigated. One very common species is *Nematus ventricosus*, the currant-worm, so troublesome to growers of gooseberries and currants. Three or four species are found upon the pines, and in 1881 some red-pines *(Pinus resinosa)* near Hull were very badly injured by a species of Lophyrus. Some of the smaller trees were found last summer to have died from the injuries of the preceding season, while others had all the lower limbs killed. The Ichneumonidæ —parasitic insects and good friends to agriculturists—are very numerous and of interesting habits and forms. As an instance of the way in which they destroy other insects, it may be mentioned that although the caterpillars of *V. antiopa* were abundant during the summer, but few butterflies developed, owing to the great number of pupæ infested with the little parasite called *Pteromalus vanessæ*? From one chrysalid over 350 minute glittering four-winged flies were counted, while many more remained in it, so that it probably fed 450-500. This chrysalid was one of a brood, all of which were similarly affected, and at different times and places during the season the chrysalids were found almost universally destroyed. A closely allied species, *P. puparum* has been most useful in checking the increase of the obnoxious cabbage-butterfly.

Lepidoptera.—Butterflies and moths, the most beautiful, and in their larval stages among the most destructive, of the insect hosts, have, despite their charms, been sadly neglected. Only two members collected last season, and of these, one, we are sorry to say, has removed from the city, possibly not to return, and has taken with him his collections. This gentleman, Mr. A. W. Hanham, is an enthusiastic lepidopterist and made a large collection during May, June and July. He has kindly furnished us, by request, with a list of his butterflies and of about fifty species of moths, adding: "I have 80 varieties Noctuinæ and Geometrinæ unnamed, and about 90 sorts micro-lepidoptera. * * * I would like to be at the meeting of the Club. I hope the information which I enclose, scant though it is, will help you in your report." A

comparison of Mr. Hanham's list of butterflies, containing thirty-nine species, with one published by the late Mr. Billings (Can. Ent. Vol. I) in 1868, and which contains the same number of species, shows that there are nine species in each which are not in the other, which with two additional species known in other collections will make a total of fifty species so far recorded from this locality. It was at first proposed to publish as an appendix a list of butterflies, but by deferring it for another year it will probably be made more complete. Among Mr. Hanham's butterflies is *Pieris rapæ*, the cabbage-butterfly, now the most common of all our species, but which has been introduced since the date of the older list. This fact shows the importance of publishing local lists, which are not only valuable as records of the species then known, but for comparison in after years by persons studying the changes which are ever taking place in fauna and flora. Among Mr. Hanham's butterflies was a Thecla (taken near Hull on 21st May) a drawing of which was sent to Mr. W. H. Edwards, who writes that it is probably *Thecla niphon*, a rare species, of which he has only taken two specimens. Specimens of *Eudryas grata*, the Beautiful Woodnymph, were received on July 10th, from Mr. Geo. Hay, with a statement that they were very numerous on his grape-vines. Lady Ritchie also sent a pair which were taken in the Chief Justice's garden. This moth was unusually abundant last season, but, although the larvæ feed upon the grape, we did not hear any complaints from fruit-growers of trouble with it, but it was reported as disfiguring the Virginia creeper in some places. The red-humped caterpillars of *Notodonta concinna* were reported on apple trees near the city. They are voracious feeders, stripping branches, and sometimes small trees, very rapidly, but are easily detected and destroyed and need not be much feared. The number of butterflies and moths already captured here indicates that this is a rich field for the lepidopterist, and when properly worked and sugared it will undoubtedly yield a rich and varied harvest.

Diptera.—This order of two-winged flies contains our most pugnacious and aggressive insects. They not only valiantly, and often successfully, defend their native glades and meadows, but also swarm forth to make war upon us in our houses. Yet so little is known about them that we are in doubt even as to the title or titles of our mosquitoes.

Some 50 or 60 species of flies have been collected, but the majority are yet unnamed, while to arrive at a correct knowledge of their habits and metamorphoses will require a vast amount of study and of original investigation in the future. As an example of the curious forms often met with in this order may be mentioned the peculiar little Hammer-headed fly, *Sphyracephala brevicornis*, taken on Parliament Hill, 14th Oct., and in Stewarton on 9th Nov.

Coleoptera.—This order, always a favourite with entomologists, from the comparative ease with which its specimens can be collected and preserved, has had the most attention bestowed upon it. Over 800 species have been collected, but work hitherto has been chiefly confined to families found upon plants—especially such as are injurious thereto—and the numerous water and ground beetles are poorly represented in our collections. It will require much systematic collecting to arrive at a fair knowledge of our numerous species of *Carabidæ*, *Dytiscidæ*, etc.

Last season especial attention was given to our hickory and butternut trees. A grove of these trees near Hull was visited by Mr. Harrington at intervals throughout the season, and the trees were found to suffer much from insects of various orders. Among the beetles captured were *Dicerca lurida*, *Chrysobothris femorata*, *Anthaxia viridicornis*, *A. vividifrons*, *Agrilus egenus*, *Dorcheschema nigrum*, *Goes occulatus*, *Goes pulverulentus*, *Saperda discoidea*, *Gaurotes cyanipennis*, *Clytus erythocephalus*, *Leptostylus macula*, *Hyperplatys adspersus*, *Chariessa pilosa*, *Magdalis barbita*, *Pseudomus truncatus*, and *Acoptus suturalis*. Several of the species had not previously been taken by him, though they seemed to be very abundant, as, for instance, *Dorcheschema nigrum* and *Dicerca lurida*. The sumacs growing abundantly in and around this grove also yielded when in flower numerous specimens of some of the same species and of other Cerambycidæ, etc., the majority of which had probably been bred from the neighbouring trees.

The following are the dates of occurrence of a few species:—*Saperda candida*, Hull, 12th July, on Service-berry; *Saperda mutica*, Fairy Lake, 16th July, on willow; *Glycobius speciosus*, taken 20th July by M. Ami, (this is not common here; our maples apparently do not suffer much from it); *Pœcilinota cyanipes*, Hemlock Lake, 22nd July, on willow; *Desmocerus palliatus*, Lover's Walk and Rideau Hall, 20th-31st

July, on elder, (an examination of the elders around the Lover's Walk later in the season showed them to be badly infested with the larvæ of this beetle and of some moth). The Locust-borer, *Cyllene robiniæ*, was very common in the city during September. The locust trees in the city suffer greatly from the ravages of this beetle; the wonder is that some which have been noticed can survive their injuries. Specimens of the beetle were received from several persons. Several specimens of *Pogonocherus penicellatus* were taken between 26th Sep. and 7th Oct. on fences, tree boxes, etc., in the city, and may possibly live in our maples. *Chalcophora virginiensis*, *C. Fortis* and *C. liberta* were taken on pines near Hull on 24th Sep. and 16th Oct. Among the last beetles taken were *Dicerca divaricata*, 30th Oct., and *Criocephalus agrestis*, 10th Nov. *Prasocuris varipes* was found in great numbers hybernating in crevices in the bark of an oak (*Quercus macrocarpus*) on 8th Dec.

Hemiptera.—This order contains the true bugs, many of which are beneficial while others are decidedly obnoxious and disagreeable. The division of this order known as the Homoptera was dwelt upon at some length by our President in his Inaugural Address, and a number of tree hoppers and their habits were described, as well as a gall insect which, as then explained, makes its galls in countless numbers upon the Hackberry, *Celtis occidentalis*, specimens of which occur near Billings' Bridge, and has received from Prof. Riley the name of *Psylla celtidis-mamma*. These insects will be found fully described in the Annual Report (1882) of the Ent. Soc. of Ont. Allied to the psyllas are the aphides so destructive to vegetation. These are of numerous species and occur in countless numbers, but they have not yet been investigated here. On 15th Oct., near Hull, such myriads of aphides swarmed in the mellow autumn air that looking across the fields towards the sun there was the appearance almost of a snow-fall, except that the minute living flakes were floating and crossing in every direction, while larger ones with more rapid motions darted in large numbers through the drifting clouds of life; these were insects of different orders, but chiefly flies and beetles. On the following day the pine-aphides were observed laying their eggs on the leaves in rows of 8-10. Their guardians, the ants, ran to and fro and occasionally one was seen dashing about in great excitement and snapping right and left, apparently at some minute flies which hovered about the aphides and which were probably parasites.

Of the second division of bugs, Heteroptera, a number of species have been collected as occasion offered, but they are mostly unnamed and their habits have not been investigated.

Orthoptera.—This order is a limited one containing but few species—our crickets, grasshoppers, etc.—yet even these few have not been collected nor their injurious habits observed. At the excursion to Des Chenes Lake, 2nd Sep., a pair of the remarkable and rather rare Walkingstick insects, *Diapheromera femorata*, were taken on hickory. Three specimens were also taken near Hull a few days previously. The common grasshopper, *Caloptenus femurrubrum*, so abundant on Parliament Square and elsewhere a few years ago, is now, apparently owing in a great measure to the labours of the English sparrows, not at all numerous, and fishermen seeking them for bait are forced to go some distance beyond the city limits.

Neuroptera.—Our dragon-flies, mayflies, shadflies, etc., have not yet been collected, although there are among them some of our most interesting insects. The species are innoxious and often very beneficial in their habits. *Corydalus cornutus*, known in the United States as the Hellgrammite fly, is of such remarkable and formidable appearance as always to attract attention, and specimens have been frequently received. The larvæ are found in great numbers along the Rideau and are extensively used as bait.

Arachnidæ and Acaridæ.—The insects included in these orders differ from all the foregoing in having an additional pair of legs, and are popularly known as spiders and mites. Mr. Tyrrell has been collecting them and has now quite a large collection. The spiders are at present being named, and many of the mites have been already determined.

In conclusion we would request the Council to urge upon the members the importance of the study of entomology, not only for its scientific value but for economic considerations as well, and for the pleasure and profit which will be gained by them. Our forests, fields and gardens are ravaged by almost countless species of insects, while many attack our cattle and poultry and a few even wound us in the

flesh as well as in the pocket. In compensation there are other species which furnish us with food and raiment, and many which are objects of exquisite grace and beauty.

W. HAGUE HARRINGTON,
J. B. TYRRELL,
Leaders, Entomological Branch 1882-83.

16th March, 1883.

REPORT OF THE ORNITHOLOGICAL AND OÖLOGICAL BRANCH FOR THE SEASON OF 1882.

To the Council of the Ottawa Field-Naturalists' Club:

The leaders have much pleasure in reporting that during the past year a number of members of the Club have taken an active part in the local development of Ornithology and Oölogy, and that some important work has been done.

In order to facilitate work, sub-excursions were held periodically during the collecting season, to various localities in the vicinity of the city. On two of them, held on the 24th May and 19th July respectively, the nesting place of a colony of great blue herons (*Ardea herodias, L.*), was visited. This heronry (which is known to have existed for many years, having been visited by the Ottawa Natural History Society in 1868), is situated on the north bank of the Ottawa River, about half way between McCaul's Bay and the village of Thurso, and is distant about 25 miles from the city, It is located in the centre of a thick swamp, which, on the occasion of our first visit, was so deeply submerged as to bar all ingress. On the 19th July, however, the water was but knee deep. After proceeding about half a mile into the swamp, our attention was arrested by a peculiar sound, which we at first thought must proceed from some distant saw-mill, or steamer on the river. As we advanced, however, the sound resolved itself into most extraordinary noises, some of which strongly resembled the barking or yelping of dogs or foxes. On penetrating still deeper into the swamp, we discovered that the noises proceeded from immense numbers of herons, some perched on the branches of the trees, some sitting on their nests, and

others flying overhead. The uproar was almost deafening, and the odour arising from the filth with which the trees and ground were covered was extremely disagreeable.

We tramped all through the heronry, and calculated that it must extend at least half a mile in each direction. The trees were swamp ash (*Fraxinus sambucifolia*), and at least two nests were built on every available one, while some of the larger ones contained as many as seven or eight. The clutch seemed in all cases to consist of three; and the nearly full grown young were scarcely to be distinguished in plumage from the adults. When driven from the nest, however, they flew very awkwardly, and alighted as quickly as possible. Numbers of the parents were feeding their young, and the capacious mouths and throats of some which we shot were completely filled with fish, about an inch long, which were evidently intended for food for their hungry offspring. The nests were all of the same pattern—great cumbersome piles of sticks, about a foot thick, but with a very shallow cavity, and no lining. They were placed from twenty to forty feet from the ground, in some instances, next the trunk of the tree, and, in others, some distance out on the large branches. The birds were very tame, making no attempt to fly until we began to climb the trees on which they were; and even then they moved lazily off, and manifested little or no alarm at our near approach to their young. It is surprising that such large and powerful birds should show so little inclination to defend their young; however, as the following incident will show, it is not always in the largest and strongest birds that this instinct is most perfectly developed.

On the 28th June a most peculiar fight was witnessed by Mr. Scott in a willow swamp about four miles from the city. The combatants were a common garter snake (Eutaenia sirtalis Baird and Girard), about a foot and a half long, which was trying to devour a young Wilson's thrush (Turdus fuscescens Steph.), and the parent thrushes, who were endeavouring to rescue it, aided in their efforts by two catbirds (Mimus carolinensis (L.) Gr.) and two robins (T. migratorius L.) The six birds were greatly excited, and every feather stood on end, as each one dashed in turn at the head of the snake. How the latter was defending himself could not be seen, as he was almost com

pletely hidden by thick underbrush. The birds were so excited that they allowed the observer to advance to within two or three feet of them, without paying the least attention to him ; the snake, however, on seeing someone approach, relinquished his prize, and glided off into the thicket. As soon as they saw the enemy routed, the storm of angry chirps ceased, and the robins and catbirds flew off; while the thrushes, although they continued to give vent to occasional mournful whistles, did not manifest nearly the same anger or alarm at seeing their offspring in human hands, as they did when the snake had posession of it. The young thrush, which had evidently just left the nest, was only slightly skinned on the wing, but was terribly frightened, and died the next day. During the whole of the combat a least flycatcher (*Empidonax minimus* Bd.) was quietly sitting on her nest in the fork of a small willow, only a few feet away, paying not the slightest heed to the exciting scene which was enacting beneath her.

Among the nests found this season might be mentioned several of the white-throated sparrow (Zonotrichia albicollis (Gm.) Bp.) About the 8th August the nest of a common Bittern (Botaurus mugitans (Bartr.) Coues) a collection of oak twigs, placed in the centre of a small clump of *Cassandra calyculata*, was found in Lake Flora Swamp, Hull, with five half-grown young ones in it.

On the 11th July, Mr. Scott found what was probably the nest of a red-eyed vireo (Vireo olivaceus (L.) Veillot) containing two eggs of the cowbird (Molothrus ater (Bodd.) Gray) *almost hatched !* This is a most interesting find, as it has been hitherto supposed that the birds which are forced to do duty as nurses to the cowbird's young, would not hatch the eggs of the intruder, unless some of their own eggs were present.*

The following additions have been made to the " List of birds shot in the vicinity of Ottawa," appended to last year's report, and published in " Transactions " No. 3, of the Club. (The numbers refer to the second edition of Coues' "Check List.")

6. *Turdus mustelinus* Gm., Wood Thrush. This bird is not uncommon with us, and was inadvertently omitted from last year's list.

*Since the above was written, the following has appeared in an article by Mr. W. Dunlop in the *Canadian Sportsman and Naturalist* for June, 1883 : " Dr. Brewer mentions a case in which a red-eyed vireo hatched three of these (the cowbird's) eggs without laying any of her own."

109. *Helminthophila peregrina*, (Wils.) Cab. Tennessee Warbler. A specimen of this rare warbler was shot on the bank of the Rideau River, on the 9th of April last (1882), by Mr. White.

142. *Geothlypis philadelphia* (Wils.), Bd. Mourning Warbler. A male and female of this shy warbler were observed, by Mr. Scott, on two consecutive days, towards the beginning of last July. On both occasions they were hopping about among the branches of a willow, in a little swamp, near the Chelsea road, about four miles from town. Their movements made it probable that their nest was not far distant, but a deligent search failed to discover it. The male bird alone was shot.

147. *Myiodioctes pusillus* (Wils.), Bp. Green Blackcapped Fly-catching Warbler. One specimen of this warbler was shot by Mr. White.

212. *Chrysomitris pinus* (Bartr.), Bp. Pine Linnet, American Siskin. These birds have been very common this winter (1882-83), great numbers of them having been observed feeding on the seeds of the white cedar trees along the banks of the Rideau. Some have even ventured into the city, and a pair were noticed in a vacant lot on Wilbrod Street, eating seeds of lamb's quarters (Chenopodium album) which reared their tops above the snow. We have no record of their ever having been taken here before.

240. *Ammodramus caudacutus* (Wils.), Sw. Sharptailed Finch. One specimen of this bird was shot last season, and sent to Dr. Coues, who remarked that this locality was both north and west of its usual range.

331. *Scolecophagus ferrugineus* (Gm.), Sw. Rusty Grackle. Every autumn immense flocks of these birds pay us a passing visit, on their southward journey. Specimens have also been shot here in June and July, which makes it probable that they occasionally breed here. This species should have been mentioned in last year's list.

534. *Haliaëtus leucocephalus* (L.), Savig. Bald Eagle. Specimens of this magnificent bird have been seen and shot from time to time in the vicinity of Ottawa; and a live bird, taken up the Gatineau some years ago, is at present living in confinement at the Royal Exchange Hotel.

626. *Tringa canutus* L., Red-breasted Sandpiper ; Robin Snipe ; Knot. This sandpiper is very rare with us, apparently only visiting us in the fall.

638. *Tringoïdes macularius* (L.), Gr. Spotted Sandpiper. This is the commonest of our shore birds, and breeds here abundantly. It was inadvertently omitted from last year's list.

684. *Gallinula galeata* (Licht.), Bp. Florida Gallinule. This bird, for a long time supposed to be exclusively a southern species, is quite common with us, and probably breeds here. It is somtimes confounded with the coot (*Fulica americana*, Gm.) but is readily distinguished from it by its red frontal plate, and the absence of marginal membranes on the toes. It is a fact worthy of note that, while the gallinule seems to be confined to the Rideau, and its tributary creeks, the coot is found exclusively on the Ottawa.

Two ducks, a male and female, which appeared to be hybrids between the mallard (*Anas boscas*, L.) and the black duck (*A. obscura*, Gm.), were shot on the Ottawa by Mr. White.

718. *Spatula clypeata* (L.), Boie. Shoveller Duck. A few specimens of this duck were shot on the Rideau River, last fall.

854. *Fratercula arctica* (L.), Steph. Common Puffin ; Sea Parrot. A young bird of this species was shot on the Ottawa, towards the end of October, 1881 (after the report for last year had been handed in.) It had probably been blown inland by a severe storm, which took place some days previous.

Mr. White, last season, obtained additional specimens of the yellow-winged Sparrow (*Coturniculus passerinus* [Wils.] Bp.), thus placing the occurrence of that species in this locality beyond question.

The leaders regret that several mistakes were inadvertently allowed to get into the report and list of birds published last year. The following corrections, therefore, require, to be made :—

Page 27, line 6, for Imelin, read Gmelin ; line 10, for Columbus, read Colymbus ; line 13, for Halialtus, read Haliaetus ; line 25, for Sayomis, read Sayiornis ; page 28, line 5, for Harporhynchus cinereus, Baird, read Harporhynchus rufus, Cab. ; line 26, for Cones, read Coues. In the list : Omit No. 12 ; for "34 *Parus rufescens*, Townsend, Chestnut-backed Chicadee," read "33 *Parus Hudsonicus*, Forster,

Hudsonian Chickadee ;" for " 132 *Vireo pusillus*, Coues, Least Vireo," read " 125 *Vireo gilvus*, Bp., Warbling Vireo ;" page 31, No. 183, for *lencophrys*, read *leucophrys ;* omit No. 329. After No. 337 read : " One specimen seen by Lieut.-Col. and Mr. Geo. R. White. When observed it was sitting on a flagstaff, at the Rideau Rifle Range. It was, unfortunately, not secured, but it was examined closely through a glass ; and, as there is no bird with which it could be confounded, there can be no doubt as to its identity." No. 337, for " Sharp-skinned,' read " Sharp-shinned ;" omit No. 398 ; No. 406, for " Brown," read " Brant ;" for " 470 Porzana Jamaicensis, Cass., Black Rail," read " 467 Rallus Virginianus L., Virginia Rail. ;" No. 507, for " Buffalo-headed,' read " Buffle headed ;" for " 555 Larus Franklinii Rich," read 556 Larus Philadelphia Coues."

Last Spring (1882) birds were first seen on the following dates :

Feb'ry 18—Shore Lark, *Eremophila alpestris* (L.) Boie.
March 8—Robin, **Turdus migratorius*, L.
" 26—Purple Finch, *Carpodacus purpureus* (Gm.) Gr.
" 29—Bluebird, *Sialia sialis* (L.) Hald.
" 30—White-bellied Swallow, *Iridoprocne bicolor* (V.) Coues.
April 1—Wood Peewee, *Contopus virens* (L.) Cab.
" 3—Purple Martin, *Progne subis* (L.) Bd.
" 3—Purple Grackle, *Quiscalus purpureus* (Bartr.) Licht.
" 4—Snowbird, *Junco hiemalis* (L.) Scl.
" 4—Golden-crested Kinglet, *Regulus satrapa*, Licht.
" 4—Song Sparrow, *Melospiza fasciata* (Gm.) Scott.
" 7—Peewee, *Sayiornis fusca* (Gm.) Bd.
" 7—Cowbird, *Molothrus ater* (Bodd) Gray.
" 7—Marsh Hawk, *Circus cyaneus hudsonius* (L.) Coues.
" 7—Herring Gull, *Larus argentatus*, Brunn.
" 8—Red-winged Blackbird, *Agelæus phœniceus* (L.) V.
" 8—Rusty Grackle, *Scolecophagus ferrugineus* (Gm.) Sw.
" 9—Black-and-white Creeper, *Mniotilta varia* (L.) V., and several other warblers.
" 10 - Wood Duck, *Aix Sponsa* (L.) Boie.
" 10—Goosander, *Mergus merganser*, L.
" 10—House Wren, *Troglodytes domesticus* (Bartr.) Coues.
" 15—Kingfisher, *Ceryle alcyon* (L.) Boie.
" 16—Sparrow Hawk, *Falco sparverius*, L.
" 19—Black Duck, *Anas obscura*, Gm.

*As one had been shot on the previous 20th December, and as the season was a peculiarly open one, it seems not improbable that some of these birds may have remained all winter.

April 19—Fish Hawk, *Pandion haliaëtus* (L.) Sav.
" 22—Golden-winged Woodpecker, *Colaptes auratus* (L.) Sw.
" 24—Meadow Lark, *Sturnella magna* (L.) Sw.
" 25—Hooded Merganser, *Mergus cucullatus*, L.
" 26—Spotted Sandpiper, *Tringoides macularius* (L.) Gr.
" 28—Wilson's Snipe, *Gallinago Wilsoni* (Temm.) Bp.
May 2—Barn Swallow, *Hirundo erythrogastra horreorum* (Bartr.) Coues.
" 2– Sand Martin, *Cotile riparia* (L.) Boie.
" 4—Blue-winged Teal, *Querquedula discors* (L.) Steph.
" 14—Baltimore Oriole, *Icterus galbula* (L., 1758) Coues.
" 14—Rose-breasted Grosbeak, *Zamelodia ludoviciana* (L.) Coues.
" 18—White-throated Sparrow, *Zonotrichia albicollis* (Gm.) Bp.
" 18—Golden-crowned Thrush, *Siurus auricapillus* (L.) Sw.
" 18—Brown Lark, *Anthus ludovicianus* (Gm.) Licht.

A large flock of White-winged Crossbills (*Loxia leucoptera* Gm.) was seen near Beechwood last June.

Large numbers of the Ruddy Duck (*Erismatura rubida* [Wils.] Bp.) arrived here early and stayed late last fall.

This winter (1882-83) unusually large numbers of Pine Grosbeaks (*Pinicola enucleator* [L.] V.) have been observed. They arrived in October, which was early for them, and, at present, they show no signs of an intention to depart. They are very tame, and may be seen boldly searching for food on some of the most public streets of the city.

GEO. R. WHITE,
W. L. SCOTT.

16th February, 1883.

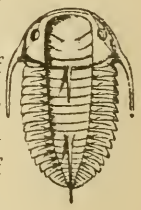
NOTES ON TRIARTHRUS SPINOSUS, BILLINGS.

HENRY M. AMI, B.A.

Recent and more detailed observations have brought out new and remarkable features as belonging to this very interesting little trilobite.

The species, as originally described by Billings, is said to possess *four* spines, thus described by him in the Report of Progress of the Geological Survey of Canada for the years 1853-56, page 340:

"One of these springs from the centre of the neck-segment and extends backwards to the third or fourth segment of the body; a second proceeds from the centre of the eighth segment of the axis of the thorax and projects back beyond the apex of the pygidium. Two others, from posterior angles of the head, extend as far as the points of the seventh or eighth pair of pleura. The spines are all slender, apparently cylindrical, and about one-fifth of a line in diameter."



Thiarthrus spinosus. (after Billings.)

These salient characters separate this species very readily from any of the other two species described by Billings, viz.:—*T. glaber* and *T. Fischeri;* also from *T. Canadensis*, Smith, described in the Canadian Journal for 1861, page 275, and from the common, *T. Becki*, Greene, in his monograph, p. 87.

In a paper read before the Ottawa Field Naturalists' Club during the winter of 1881-82, on "The Utica Slate Formation," the writer had occasion to notice, in regard to the same species, that whilst the majority of specimens found indicated in the presence of a spine on the *eighth* thoracic segment, still, in a few specimens he was able to observe another spine on the *ninth* thoracic segment. It was this fact which led him to say: "for the present we are satisfied with stating that it (*T. spinosus*) possessed at least more than four spines."

Now, the most perfect specimen yet procured from the deposits of the Utica at Cummings' Bridge, Gloucester, Ont., shows clearly that, not only did the species in question possess "more than four spines," but that the eighth, the ninth, and likewise the tenth thoracic segments of the one individual have each a spine proceeding from the central portion of their axis, which three spines, along with that on the *occipital*

or neck-segment, and the two curved ones attached to the posterior angles of the cephalic shield, give as many as *six* spines, which *Triarthrus spinosus*, Billings, possessed. These facts are not founded on this specimen alone, for there are several others, less perfect however, which show the same characters. Of those three spines on the back of the trilobite we find that the anterior one appears to be the shortest; it, however, extends "beyond the apex of the pygidium;" the posterior one is somewhat longer than the anterior, whilst the intermediate one is very long indeed—about twenty millimetres; it is the longest spine of the individual, and projects over ten millimetres beyond the apex of the pygidium. All these spines are more or less cylindrical, attenuated to a sharp point—the longest one appears to be grooved below, no doubt to allow it to rest partially over the posterior one. *(See Plate.)*

It is somewhat difficult to imagine how it happens that so many specimens have been collected by different individuals, which show only one spine on the thoracic segments and that on the eighth. It may be due in part to the state of preservation of the specimens and delicacy of these spines, which, perhaps, were quite brittle (a mere fragment of the point of attachment often indicating the previous presence of the spine), else some solution may be found in the fact that the eight anterior thoracic segments are held so close together, being scarcely ever separated, whilst, beginning with the ninth thoracic segment, the remainder of the segments, down to the pygidium, are almost invariably found detached and separated from each other.

T. spinosus, when adult, has been observed to possess as many as thirteen segments in the thorax (Billings and others); therefore, between the eighth thoracic segment and the pygidium, there would be normally five segments; of these, we know that two at least possessed spines. From the evidence gathered in the examination of numerous specimens, it would not be at all surprising to discover that from the eighth to the thirteenth segments each had a spine proceeding from the centre of the axis; were such the case the species would be much more spiny than at first it was thought to be —as it would possess not "four," nor "at least more than four," nor more than "six," but *nine* spines.

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